

pretty hard work to climb the trail, loaded with the heavy bundles of "driers," paper for preserving the specimens. At one point the entire party stopped to rescue one of them from a ditch where he had rolled with his load of driers, landing neatly with heels up, nicely balanced on his pack. The day was consumed in making the trip of seven miles, including a rise in altitude of 1,800 feet.

They had an arrangement with the guide to return for them on a certain day, but at the appointed time he failed to appear. A messenger being sent to Baracoa for him, he sent a polite reply to the effect that he would not transport that luggage over that trail again for \$1,000. Another outfit was obtained, and the party started on the return trip. Half way down the mountain a trunk on the back of one of the mules shifted and the mule kicked. The "mule whacker" and his assistant thereupon proceeded to remove the box from the animal's back. The scientists watched him with interest, supposing he was going to shift the luggage and make a place for the box elsewhere. But what was their astonishment to see him calmly set the trunk down beside the trail and prepare to continue the journey without it. The professors expostulated in the best mixed Spanish and United States at their command, and one of the Cooper boys, coming up, continued the job in good, healthy Cubanese. All to no avail. The mule driver herded up his gang and went light-heartedly on his way, leaving a trunk of valuable specimens by the roadside.

A return to the Cooper ranch, the securing of a Cooper mule, the slow and painful adjustment of the trunk upon its back, and a tardy arrival in Baracoa were among the things that helped to form Dr. Earle's opinion of the Cuban laborer. The guide not only demanded, but apparently expected full pay for the trip, and was grieved and astonished when the hard-hearted Americans did not see it in that light.

On the evening before they were to sail a man appeared at the hotel and applied, as they supposed, for the job of putting their baggage on board the steamer when she came in next day. They spoke a little Spanish, one of the waiters at the hotel spoke a little English, and between them, as they thought, the bargain was satisfactorily made.

The steamer's whistle sounded at noon the next day, and no one had yet come for the baggage. They hunted up the waiter and ascertained, through the medium of his pulverized English, that the man was a boatman, and had only agreed to take their things from the dock to the steamer in his boat. All requests to find a teamster or expressman who would take their traps to the dock were met by shrugs, outspread hands, and other eloquent gestures of impossibility. It was a saint's day, and, worst of all, the saint was good San José. It seemed that half the male population of the region was named after San José and the rest were related to them. The town was given over to processions and rejoicing, and not a man in it would harness a horse that day.

Time grew short. There was not another steamer for a week, and the Americans grew desperate. It finally ended in the securing of two disreputable wheelbarrows and the piling of boxes of valuable specimens thereon; and then might have been seen the spectacle of two very warm American scientists trundling their baggage through the streets of Baracoa, amid the admiring inspection of an interested populace. One wheelbarrow broke down, and it was necessary to leave the things beside the road and make a second trip to get them; and when the perspiring botanists were finally on board the steamer, it was with a rooted conviction that the Cuban laborer is a gentleman who does not have to work.

Baracoa is a region of beautiful climate, scenery, and vegetation. The range is two or three miles back from the coast, and rises to a height of 3,000 feet. On the flanks are banana and coconut plantations, the product of which is all brought down for shipment on the backs of the ridiculous little mules, or in canoes on the little rivers. There are three American families in the region, but they lead a rather lonely life, especially the women, who have to do all their shopping by mail order in the United States. In the stores of Baracoa, a town of 3,000 inhabitants, the scientists could hardly find provisions for a camping expedition. There were no decent canned goods, and they visited four groceries before they found any cornmeal, while that finally discovered proved to be moldy and uneatable. The yam is the basis of the native menu, and dried codfish from Canada the staple meat, the people consuming more of this than of the fresh fish with which the waters abound. A great many live almost entirely on fruit, and their physique and general condition do not speak particularly well for that kind of a diet.

"The average man, white or black, is rather a poor specimen physically in Cuba," said Dr. Earle.

The country impressed him as one of great resources, almost totally undeveloped. Since the completion of the Cuban Central Railway a few months ago, fine mahogany and West Indian cedar, used for making cigar boxes, are being taken down to Santiago by rail. But in large sections all transportation is still by mule and small boat. It is necessary to cultivate the banana a little, but the coconut, once planted, requires no cultivation; oranges and limes grow half wild, and in general all fruit trees grow practically wild after being planted.

"The most striking feature of the vegetation is the royal palm," said Dr. Earle. "It is very abundant in all the lowlands, and grows up to an altitude of 2,000 feet. It reaches a height of 100 feet, and the trunk is frequently two feet in diameter. It has a hard rim, which is used for slabs to board up the sides of the plantation houses. Most of the Cuban shanties are thatched with the leaves, and there is a membranous stipule at the base of the leaves which they cut out in pieces two or three feet square and put over the sides of their houses like building paper. Such a house will not have a dollar's worth of purchased material in it. A handful of nails represents the sole monetary outlay.

"The tree ferns form another salient feature of the vegetation. They grow 30- or 40 feet high, with a straight trunk and tuft of fronds at the top. But they are so tangled in a mass of vines and creepers in the

forests that it is difficult to see them to advantage. And, speaking in general, there is no such pageant of bloom at any time in the tropical forests as comes in our Northern woods in springtime. It is a continuous thing, scattered over the whole year. There is splendid collecting around Baracoa, where it is very moist. It is far drier at Santiago, and on the southern coast in the dry season it is extremely like New Mexico and Arizona, and the vegetation partakes of the same general characteristics.

"At the front of the mountain range that rises to the rear of Baracoa are jagged rock peaks, but in behind is an area of comparatively level land, covered with heavy forests. There are numerous deep, moist sinkholes, filled in with tree ferns and other moisture-loving growths, and yielding the collector a rich crop of ferns, mosses, and liverwort.

"Later we visited Alto Cedro, a construction camp on the Cuba Central Railway, where work is being actively pushed. It is in the heart of the great forest area that occupies the interior of Eastern Cuba, extending unbroken for sixty miles, and containing mahogany and West India cedar of great value. The forest is an almost impenetrable jungle of vines and bushes, and in the rainy season is almost a swamp. Owing to the difficulty of travel and transportation, the botanical exploration of Eastern Cuba is going to be anything but an easy job, but the results to be obtained will be more than enough to justify the effort. A rugged, mountainous region west of Baracoa is almost absolutely unknown. The high range near the west coast of Santiago is practically unknown, and promises rich returns."

Dr. Earle brought back 1,700 different specimens, about one-third of the collection being flowering plants, the rest including mosses, ferns, and fungi. He leaves in a few days for Porto Rico, in company with Dr. M. A. Howe, of the Botanical Museum. The latter goes to look for seaweeds, and Dr. Earle will collect fungi and examine plant diseases in the island.—N. Y. Times.

THE HABITABILITY OF MARS.

By LEIGH PAGE.

TELESCOPIC observation of Mars reveals three classes of markings, the permanency of which shows that they are due to surface conditions and not to clouds, such as we see on Jupiter or Saturn. The white polar caps already described, although they occupy only a comparatively small area, are specially conspicuous. Secondly, there are bluish green patches covering about three-eighths of the planet's surface, and lastly orange and yellow regions extending over the remainder. The latter have always been conceded to be land and the general opinion at present is that they are not only land, but deserts. They have exactly the color of deserts, and they behave just as arid countries should, that is, by not behaving at all—by remaining unchangeable.

For a long time the darker portions were supposed to be seas, and the early areographers have given them names conforming with this idea. Observations made at the last favorable opposition, however, satisfactorily disprove their aquatic character. Not only are they of every grade of tint, but even the same portions vary in color at different times. The polariscope shows no traces of the polarization which should characterize all light reflected from a smooth surface such as that of a liquid. Moreover, at times in the year the majority of these so-called seas gradually fade away and become indistinguishable from the yellow regions. The most conclusive evidence of all, however, is that the canals, to be shortly discussed, do not stop at the edge of these dark areas, but actually cross them.

Although the seas are not seas, they can be explained absolutely satisfactorily by ascribing their appearance to the growth of vegetation. In winter, the time that they turn yellow, the vegetation disappears; in summer, when water from the melting polar caps reaches them—for they are probably the lowest portions of the planet's surface—trees and plants spring up and their color becomes green again. The permanently yellow regions are never touched by water and so remain everlasting deserts. Of course, all this reasoning presumes that the polar caps are really composed of frozen water, which there is sufficient heat to melt.

Now comes the most interesting part of the study of Mars—the evidences of intelligent human beings—the canals. In 1877 the Italian astronomer Schiaparelli discovered these straight lines on the planet's disk. At first no one else would believe in their existence, for it was not until 1886 that any other astronomer succeeded in seeing them. Since that time they have been repeatedly observed and new details connected with them have been discovered.

We really do not see canals themselves, for they would have to be fifteen or twenty miles wide to be visible to us even with our best telescopes at such a distance. What we do see are probably belts of verdure bordering their shores. Their length varies from 250 miles to 3,540 miles, greater than the distance from New York to San Francisco. The belief that the canals are artificial is supported by the following facts: They are without exception arcs of great circles, joining different points in the shortest lines possible. Moreover, they make a system. Different canals do not cross each other haphazardly, but several meet at one spot. There are extremely few places where only two canals cross; usually six or seven come together at the same spot. This suggests that they are fissures radiating from centers of explosion. But such cracks would gradually become narrower and narrower toward their extremities, while the canals maintain the same width throughout. Besides, cracks would reach an end, while the canals invariably go to some other intersection. The regularity of the canals seems to disprove all natural explanations. Rivers do not commonly have a bump for mathematics, and meteorites are not especially trained to plough straight furrows from one center to another. Canals they seem to be, and if they are canals the economic part of the question is very simple. The only water on Mars, if indeed there is any, is collected every winter in the polar caps by successive frosts, for rain never falls on any part of the surface. Now the question of all importance with

the Martians would be irrigation. As telescopic observations of the terminator show no mountains of any size the Martians would be able to dig these tremendous ditches to convey the water from the polar seas to the arid interior. In the dark green portions of the planet's surface the canals probably overflow, thus producing vegetation all over them during the summer months, while in the yellow regions the only verdure is along the banks of the canals and in the oases which appear at every junction.

These oases are from 75 to 150 miles in diameter and are perhaps the sites of Martian cities. They are proved not to be lakes by the same means that the dark blue regions were proved not to be seas.

One mysterious phenomenon in connection with the canals is their gemination. Not all become double, and those that do, become so only at fixed seasons of the year. The fact that in the same telescopic view will be seen some double and some single canals seems to show that this phenomenon cannot be an optical illusion. Perhaps some explanation will be forthcoming as a result of observations to be taken at the next favorable opposition in 1907.

Even if Mars is really inhabited, only one-half of the problem of its life has been settled. Much more difficult than the question of his existence is the speculation as to what the Martian is like. However, we may derive one of his possible characteristics from the mere effect that the planet's mass would have on the size of its inhabitants. Contrary to what would be supposed at first thought, the Martian would be likely to be much larger even than Goliath. A little reasoning will make this clear. The larger a terrestrial animal the more unwieldy it is. An elephant refuses to jump like a squirrel not because he may consider it undignified, but simply because it is physically impossible for him to do so. If we could, we would leap over a high fence instead of laboriously climbing it. Our inability to perform such feats depends not so much upon our physical build as upon the force of gravity. Consider for instance the case of standing erect. The weight of the body, which is of three dimensions, opposes itself to this, whereas the cross-section of the muscles of the knees, which has only two dimensions, enables us to do it. Consequently the larger a man the sooner standing tires him. The same principle can be equally well illustrated by inanimate objects. Of two similar candles, one ten times as big as the other, the larger will settle under the great pressure due to its weight, while the smaller will stand indefinitely.

Now let us transfer our minds back to Mars. Imagine a Martian three times as large in every dimension as one of ourselves. On the earth he would weigh twenty-seven times as much, but since the superficial gravity of Mars is only about one-third that of the earth, he would weigh only nine times as much there. But the cross section of his muscles would be nine times as great. Therefore he would experience no more difficulty in standing or walking than we do. Yet since his muscles, having three dimensions, are twenty-seven times as large as ours, they would be twenty-seven times as effective. Furthermore, work on his planet, owing to the small gravity, would require only one-third the effort. Accordingly, he would be able to accomplish eighty-one times as much as a terrestrial man. In reality the surface gravity on Mars is slightly more than one-third that on the earth, so this ratio should be fifty rather than eighty-one. Thus if nature has taken advantage of this physical fact, is it at all remarkable that such beings might have constructed immense canals over a nearly level surface?

The reader must keep in mind that these deductions refer only to the possibility, not at all to the probability, of such giants living in Mars. These mathematical truths permit the existence of such beings there, but it may well be that the Martian, if such there is, is of the same size as man. Anyway the canals could be explained as well by attributing superior brains to the Martian as by endowing him with enormous muscle. At all events he must have brains at least equal to our own if the wonderfully regular works of irrigation are his.

Having speculated on the size of the Martian, let us next consider his shape. It is not at all probable that the highest forms of beings on Mars, where the environments are entirely different from our own, would have been evolved similarly to man. The latter is somewhat of an accident. His physical organism is not even the highest known to us. His brain is what has made him the dominant creature of the earth. On Mars brain may have developed to its highest stage in some totally different kind of animal. Man on Mars may even look more like a lizard than anything else, although of course his physical form would be largely determined by the uses he made of the several parts of his body. There is very little chance that he would resemble us in any physical features.

Now we have examined the arguments, pro and con, concerning the possibility of life on Mars, and have reviewed the evidences of its habitation. Many believe that the earth is the only place where life and human beings can exist. To be sure we have no more positive proof than that here roughly outlined to lead us to believe that there are other inhabited worlds, but on the other hand we have absolutely no negative evidence on this point. Even if Mars be dead, what reason is there for believing that none of the countless millions of suns, spread out in all directions in infinite space and showing all stages of development, have planetary systems at least one of whose members has reached a suitable condition and developed life, possibly of a far higher order than any known on earth? Such speculation, however, must be left for the minds of poets; where there are no means of obtaining data, here scientific investigation cannot proceed.—Yale Scientific Monthly.

Straw Presses in Russia.—The British consul-general at Odessa states that presses for pressing straw from the thrasher in the field for convenience in carting to the homestead where it is used for winter fuel can find a ready sale in that district. A machine was offered at \$720, but did not work successfully. It is thought that a press which would meet all requirements would be sure to sell.