three children. The original islanders belong to the widely scattered Malayo-Polynesian family. Although more than 3,000 miles of ocean intervene, Hawaiians and the Maoris of New Zealand can readily understand each other's speech. Cannibalism, idolatry, and human sacrifices were practised at the time of discovery, though the cannibalism was only moderate, and to some extent a part of the religion. The religious adhesions of the present population are almost as diverse as the races are polyglot. The census of 1896 gave Roman Catholics 26,363, Protestants 23,773, Mormons 4,886, Buddhists, Confucians, and other Oriental sects 44,306, unknown 10,192. Notwithstanding the recent influx of foreigners due to political changes, the condition of population offers material for serious consideration. Agriculture is the industry of the islands, and laborers are imperatively needed in agriculture. The larger part of the arable land of the archipelago is devoted to sugar production and the conditions under which this industry is practised at present discourage a peasant proprietorship of the land. Without such proprietorship there can be little hope of a permanent population. There are at present a total of about one hundred miles of railroad in operation. Most of the important points on the larger islands are connected by telephone or telegraph. Oahu and Hawaii are connected by submarine cable, and it is not improbable that by the time this article is in print a cable will be in construction to join San Francisco and Honolulu. The valuation in 1900 of the imports into the United States was $20,707,903, and of the exports from the United States to the islands, $13,509,148. The facilities and conveniences of living in Honolulu and Hilo, the chief towns, are the same as those in like cities of the United States. The cost of living is, since annexation, however, higher, largely due to the servant question. The Chinese constitute the chief source from which this element is drawn, and since annexation they are excluded from the islands as from all other parts of the Union.

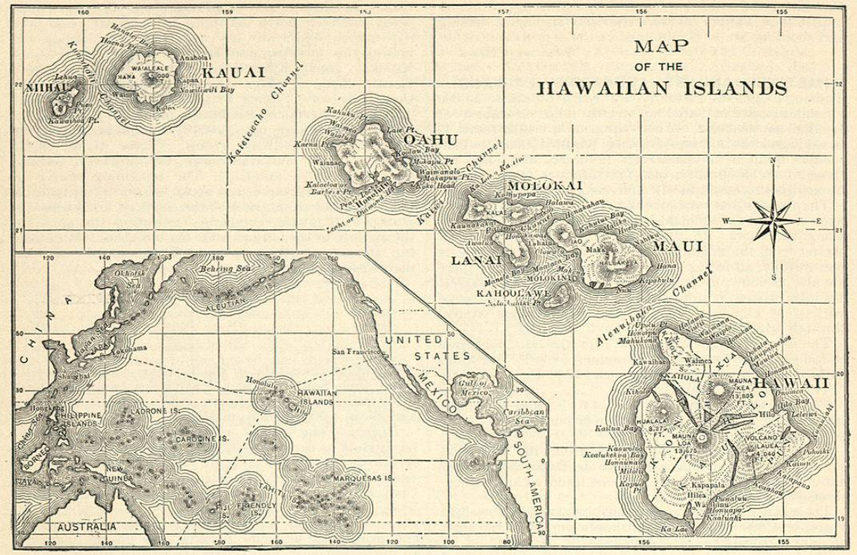

FIG. 2537.

Geography and Geology.—The Hawaiian Islands are of volcanic origin. They rise from the general level of the ocean bottom to the surface a distance of 14,000 to 19,000 feet. This rise is so abrupt that this great depth of water is found from 30 to 50 miles from shore. Above sea level the islands attain elevations that in many places rival the heights of the Alps. The coast line is in places low, in others it rises often sheer 2,000 feet. The following tabular view shows the chief elevations.

Islands.	Name of mountain peak.	Height above sea, feet.
Hawaii	Mauna Kea	13,805
Hawaii	Mauna Loa	13,675
Hawaii	Hualalai	8,275
Hawaii	Kilauea	4,040
Hawaii	Kohala mountains	5,000
Maui	Haleakala	10,032
Maui	Eeka	5,820
Kahoolawe	(Highest point)	1,130
Lanai	(Highest point)	3,000
Molokai	(Highest point)	3,500
Oahu	Kaula	4,000
Kauai	Waialeale	5,000

Geologically, Hawaii is the most recent and Kauai the eldest of the group; the islands increasing in age from the southeast to the northwest. Kauai from its greater age has the best weathered soil, and by its inhabitants is proudly called the garden island. The soil of the islands is weathered lava. It is extremely porous. Two general classes are recognized, dark red soil, from simple weathering, and light red and yellow soils from weathering plus the action of imprisoned sulphurous and other gases. The dark red is the better and more durable agricultural soil. The light red and yellow soils require careful cultivation. But few minerals are found. Sulphur, pyrites, copperas, sal ammoniac, common salt, and a few others are the chief ones. Hawaii has the only active volcano, the world-renowned crater Kilauea. The summit of Mauna Loa has a crater, Mokuaweoweo, occasionally active. From Hilo, the chief town of the island, a good road, thirty miles in extent, runs to Kilauea. Haleakala, in Maui, is an extinct crater, the largest known in the world. Although more than 10,000 feet high, so gentle is the slope that it can be ascended to the top on horseback. Most of the other mountains of the islands are more or less easily rising slopes, and mountaineering is not arduous.

Flora and fauna. The mere enumeration of the varieties of flora on the islands would exceed the length of this article. Hillebrand, in his "Flora of the Hawaiian Islands," names 999 species and 365 genera, and many others have been introduced since his book was published. "The variation in the climatic conditions due to altitude and location . . . together with the arable soil at all altitudes, justify the belief and warrant the assertion that almost every tropical and temperate plant can somewhere be grown successfully on this island" [Hawaii] (Dr. W. C. Stubbs, "Report on the Agricultural Resources, etc, Hawaii," Washington, 1901). Over seventy species of birds, mostly water fowls, have been enumerated. Captain Cook found hogs, dogs, domestic hens, and rats, on the island, also a day-flying bat. Cattle, goats, and hogs, escaped from domestication, run wild (goats were introduced by Vancouver in 1792) and have damaged the forests incalculably.

Climate.—The Hawaiian Islands are climatically within the sea level isotherms of 70° and 75° F. The average sea-level temperature of the group is 4° to 6° lower than the calculated average of the latitude (see table, article *Climate*). The distinguishing characteristic of Hawaiian climate, compared with that of other tropic islands, is the combination, in its temperature, of mildness and equability. There are many other tropic islands that have great or even greater equability of temperature, but they lack in greater or less degree the other element of mildness so pronounced in the perpetual, pleasant summer of the Hawaiian archipelago. The following table shows the temperature of Honolulu compared with that of some other insular localities in or near the tropics.

	Average Temperature of—		
	Year.	Warmest month.	Coldest month.
Honolulu	74° F.	78° F.	70° F.
Praia, Cape Verde Islands	76	80	72
Las Palmas, Canary Islands	70	75	65
Bermuda	70	80	63
Nassau, W. I.	77	82	72
San Juan, Porto Rico	81	84	76
Saint Helena	71	76	68
Mauritius	74	79	69
Tahiti	77	80	74
Levuka, Fiji Islands	78	82	75
Réunion	74	79	70

The average temperature and rainfall at Honolulu are:

	Temperature.	Rainfall (inches).
January	70	3.5
February	71	6.0
March	71	3.3
April	73	3.0
May	74	3.0
June	76	1.6
July	77	1.8
August	78	2.0
September	78	2.0
October	76	2.5
November	74	5.5
December	72	4.7
Year	74	38.4

The temperature seldom, if ever, rises to 90° F. According to C. J. Lyons, the territorial meteorologist, a temperature of 90° is to be regarded with suspicion, and a monthly mean of 80° calls for inspection. The average daily difference between the highest and lowest temperatures at or near sea level is from 10° to 14° according to the season of the year. The temperature of a particular locality will depend upon the elevation of the place. Owing to the small land areas of the different islands the rate of decrease in temperature due to altitude is practically that found in ascending in the free air, namely 1° F. for every 300 feet vertical ascent. The altitudes of some of the mountain peaks of the islands place their summits within the limits of perpetual snow. The crests of Mauna Kea and Mauna Loa are seldom entirely free of snow. The rainfall of the islands follows the regimen of tropical islands similarly situated with respect to the prevailing winds. The key to the rainfall is altitude and the prevailing winds of the region and the season. The rainfall is plentiful wherever the land rises sufficiently to be a barrier to the winds of the region. At sea level the rainfall is relatively small, but it increases rapidly with elevation up to 6,000 feet, and then decreases. From the orography of the islands the greatest variety of rainfall distribution is observed. On Hawaii the average annual rainfall varies from 140 inches at Hilo on the east coast to less than 30 inches on the west coast. On Oahu a more striking difference is observed. At Honolulu, 50 feet above sea level, the average annual fall is 38 inches, while about 15 miles east, at Nuuanu, 850 feet above the sea, the average is 132 inches, and less than 25 miles west, in a sheltered valley, the rainfall is only 15 inches. Even on the same plantation, the rainfall on one part will be abundant for the most luxuriant tropical growth and on the other part irrigation will be necessary to grow an ordinary crop. The porosity of the soil is, as already stated, great, so that notwithstanding the torrential downpours that occur on the elevated lands, the soil remains free from dampness. The water runs through it with great rapidity. The average relative humidity of the islands is about 75 per cent. of saturation, varying somewhat with the direction of the wind. It is greater with southerly and less with northerly winds. The prevailing winds of the archipelago are the northeast trades. For nine months, March to November, they blow with almost unfailing regularity. During the other three months the islands are more or less under the influence of the southwest antitrades. These antitrades are the disagreeable winds of the islands. It is only during their prevalence that the sultriness and oppressiveness of the tropics become manifest.

Health.—Statistics as to the prevailing diseases of the islands are not plentiful. Leprosy, an imported disease, is now endemic among the natives. Great care, however, is taken to prevent its ravages and stamp it out. The government years ago established a leper colony on the high table-land of Molokai, and hither all afflicted are sent and carefully cared for.

Among the causes of death given in a recent report for the city of Honolulu, phthisis claimed more than 10 per cent.: old age and heart disease about 7 and 6 per cent. respectively. Among other causes enumerated were pneumonia, bronchitis, diarrhœa, and paralysis.

W. F. R. Phillips.

HAW, BLACK. See *Viburnum Prunifolium.*

HAY FEVER is the popular title for an annually recurring affection which involves the mucous membranes of the ocular and respiratory tracts and is associated with certain symptoms which can be accounted for only by reference to the nervous system. It, or a very closely allied disorder, occurring during the early summer in England, was first described by Bostock in the Medico-Chirurgical Transactions for 1819, under the name of *Catarrhus Æstivus;* and in his work upon the affection now treated of, Dr. Wyman advocates the use of the term *autumnal catarrh* as more correct, and not involving the absurdity of associating a disease with an impossible cause—for the season of hay-making, in the United States at least, is long past before hay fever makes its appearance. But the title has become so embedded in the popular mind that there seems to be no escape from

what is indisputably a misnomer. Basing the suggestion upon the view that the affection depends upon engorgement of the nasal mucous membrane, with associated reflex nervous symptoms, Mackenzie, of Baltimore, has proposed as a new name *coryza vasomotoria periodica*, which has the advantage of accuracy at least.

The peculiarity of the affection is its annual recurrence, in the same individuals, with almost ludicrous exactness in point of time, throughout, in many instances, the years of a long life. Thus an examination of the narratives of their cases, written by those who suffer from *hay fever*, will reveal the fact that the attack occurs upon the same day, or even the same hour of the day, in each year, and in none is there a variation of more than a few days. This regularity of return is apparently but little affected by the peculiarity of one year as compared with another. Whether the season is wet or dry, whether as a consequence vegetation is rankly growing or falling into decay, appears to make no difference. Another singular fact is that the sufferer from this disease in Philadelphia or Baltimore may rest assured that, at the precise time he begins to feel the approach of his enemy, his fellow-sufferer in a place as far removed geographically as Boston is subject to attack at the same time, though his climatic surroundings are quite modified.

The attacks are, however, not of similar severity each year, but will vary somewhat. Why this should be so it is hard to determine; but it has been observed that when, as in 1885, there is a prolonged drought in the early summer, succeeded by heavy rains leading to a revival of vegetable growth in the month of August, the season is likely to be a bad one for sufferers from autumnal catarrh.

Age appears to have nothing to do with this affection, some persons experiencing their first attack as early as in their third or fourth year, while others escape the formation of so undesirable an acquaintance until quite mature life. It is a curious fact, revealed by an examination of Dr. Wyman's table of eighty-one cases, that males are more likely to be sufferers in early life than females; which is in accordance with the observation of the writer, although there is no particular significance in it, so far as his knowledge goes.

Another peculiarity of this disease, and one which has been noticed by many observers, is its greater prevalence among those who are not compelled to resort to manual labor for a livelihood. Not that it does not occur in this latter class, for some such are recorded by Wyman, and many have fallen under the observation of the writer of this article and others; but that it is of comparatively rare occurrence among the laboring classes is a patent fact. The writer's experience leads him, however, to think that this difference is becoming less marked of late years, and that not only is the aggregate number of cases increasing, but that periodical catarrh is extending among classes which were at one time in a great degree exempt from its visits.

Having now referred to some of the peculiarities of this troublesome affection, I may next proceed to a description of its *symptoms* and *course*, as ordinarily observed.

About the middle of August the patient experiences itching of the eyes and pharynx, which at times is intense, and is accompanied by most inordinate and frequent sneezing. The irritation of the eyes and throat appears to be without cause, but the sneezing seems to be provoked by bright light, cool currents of air, or some exposure to the causes which ordinarily are regarded as provocative of catarrh. At first these attacks are infrequent and of moderate severity, but they soon become more severe and more frequent. On first getting up in the morning, while dressing, and often during breakfast, the attacks of sneezing are prolonged, and altogether unaccompanied with the grateful sense of relief which in other circumstances is experienced in connection with this manifestation. Every exertion increases these symptoms, and there accompanies them that general feeling of discomfort, with slight acceleration of pulse, which have earned for the disease the misnomer of hay fever; yet there is no record showing the existence of a higher temperature. The amount and severity of these symptoms will vary somewhat with different years, but they will always exceed in both respects those observed in ordinary coryzas.

Usually symptoms of bronchial irritation manifest themselves in about a week, and dryness and injection of the fauces are followed by a tickling cough, accompanied with but little expectoration. After a time the cough becomes more severe, paroxysmal in character, and is often accompanied with much soreness in the chest, which is somewhat relieved when expectoration is established. Like the coryza, the bronchitis varies much in intensity in different individuals, and somewhat in the same persons in different years. In some it does not exceed in severity that attending a mild cold, in others it becomes a most serious affection, and is occasionally accompanied by expectoration of mucus streaked with blood. The observation of the writer, however, has not brought him in contact with a case in which true pneumonic sputa were present, although he is familiar with one in which the expectoration has on two occasions very nearly approached that character. The physical signs on auscultation are those of bronchitis.

In many cases, after a most harassing experience extending over ten days or two weeks, both the coryza and the cough lessen in severity. The former almost entirely disappears, and while the latter may persist as a most exasperating tickling, especially at night, convalescence passes into complete recovery, the whole course of the disease having lasted for from three to four weeks.

But in the vast majority of cases the advent of the cough is accompanied by asthmatic symptoms of more or less severity, and in very many these symptoms cause everything else to appear as insignificant. Indeed, more severe asthma than accompanies some cases of autumnal catarrh is rarely, if ever, seen.

The first asthmatic symptoms generally appear about the 25th of August, and are often brought on by a spell of coughing, some unusual exertion, or in many cases by the change of wind accompanying a thunder-storm. From the time of their first appearance these symptoms do not entirely disappear until the conclusion of the annual attack, which is ordinarily about the end of September, although in some cases prolonged until a later date. All the time there is more or less difficulty of breathing, accompanied with true asthmatic râles. Upon percussion the chest is more than usually resonant, showing the existence of at least a temporary emphysema; but upon applying the ear to its parietes, it is found to be filled with dry cooing and sibilant murmurs, reminding the listener of nothing so much as "a bag of whistles." Indeed, these sounds are generally readily perceptible at a considerable distance, and become more marked at the approach of a paroxysm.

Than a severe paroxysm of dyspnœa, such as is frequently seen in these cases, there is scarcely anything harder to bear or more painful to witness. The approach of the attack is signalled by an increase in the loudness of the chest murmurs, and by increased difficulty of breathing. The patient cannot lie down, and, indeed, very soon cannot lean back in his chair. Sitting or standing, the patient will seek a firm surface on which to lean, and planting his elbows firmly upon it for support, will gasp for breath. The sonorous chest sounds lessen, the inspiration becomes comparatively lengthened, and the expiration much hurried. The collar will be unbuttoned, the face assume a yearning and almost despairing expression, the eyes be suffused and tearful, while the efforts of the arms, shoulders, and all of the muscles accessory to respiration are most severe and accompanied with a very copious perspiration. The sense of fatigue is extreme, and to the expression of anxiety is added one of intense weariness; but the efforts are unrelaxed, for, though wellnigh useless, they are involuntary and cannot be lessened by any effort of the will. No

sounds whatever come from the chest, and while the patient feels as if he was breathing in vacuo, the inexperienced spectator will think that actual suffocation is impending. If not interfered with this state of things may last for from a few minutes to several hours. Gradually there will be a return of wheezing noises in the chest, the respiration will become somewhat less shallow, and the sense of suffocation less acute; and if the improvement continues the expression of relief becomes marked upon the face, and the sufferer drops into sleep without much reference to the position he occupies.

But the relief experienced is very generally only partial, and the respiration continues laborious and oppressed, while exercise or any physical effort is impossible without immediate aggravation of the symptoms. This state of things continues until the end of the season, though lessening gradually with the diminution of the bronchitis and the disappearance of the cough. The writer has known this asthmatic period to last for from three to six weeks, during which time the patient could not go up and down stairs, could not sleep at all without the aid of anodynes, nor indulge in the slightest dietary indiscretion. The eating of large amounts of food late in the day, or of indigestible food at any time, is likely to bring on an acute paroxysm, and the same result is very apt to follow a prolonged spell of coughing. Very often sleep can be obtained only in the upright position, either in a chair or propped up in bed with a large number of pillows.

In many cases of periodical catarrh the asthmatic symptoms never attain the severity of those which have been described, but they are present in a more or less modified form in the majority of instances, especially at night. As has been said, when the asthma is a marked feature in the individual cases it overshadows all other symptoms, and we shall not obtain the vividly thrilling descriptions of the sufferings from catarrh, which encumber books upon this special topic, from those who have severe asthma. They will express themselves as quite ready to bear the annoyances of the most violent coryza and the most irritating cough, if they can only secure immunity from the dyspnœa and orthopnœa which they have learned to dread.

After the middle of September there is a gradual declination in the severity of all the symptoms, and by the end of the month they have in great measure disappeared, though in the severer cases there may remain a tickling cough and the liability to attacks of oppression to a much later date. Indeed, it would seem, in the more severe cases, and especially in those which suffer much from asthma, as if there was a tendency to a gradual prolongation of the after-period, so that throughout the winter any severe cold is liable to be complicated with asthmatic symptoms. That this should be the case is quite natural in view of the causal relation existing between asthma and true emphysema. Yet permanent emphysema is rarely present, probably owing to the shortness of the attacks, and to the fact that most patients enjoy a sufficiently long period of health between them to prevent organic changes taking place in the elastic lung tissue.

Observation has convinced the writer of this article that the recurrence of these attacks, unmodified by effective treatment, tends to fasten the habit more firmly upon the system, as well as to increase the length of the after-period. His experience has taught him that if the season is anticipated by a suitable change of residence, and the severity of the attacks modified by appropriate treatment, the force of the annual habit is lessened, and while it may not be entirely obliterated, the acuteness of the periodical attacks will be diminished. It is this fact which leads him to urge careful attention to those cases which occur in children, as in them there is more hope of being able to attain good and permanent results. As a general thing, the first attacks are less severe than the succeeding ones, and there would seem to be more encouragement to expect good results by prompt and *early* treatment.

When we come to consider the *nature* and cause of this curious affection we enter upon a wide field, and one upon which most conflicting theories contend. That this should be the case is natural from the absence hitherto of any researches throwing much light upon any anatomical peculiarities pertaining to the affection. That there are such peculiarities, however, at any rate associated with it, cannot be doubted in the face of the observations recently made by such authors as Harrison Allen, J. N. Mackenzie, Sajous, and others; but it is as yet too early to conclude with certainty that these anatomical peculiarities are undoubtedly the cause of the affection under consideration. According to these observers the subjects of "hay fever" are all alike in presenting certain peculiarities in the anatomy of their nasal cavities. According to Harrison Allen, the nostrils are obstructed by deflection of the septum, hypertrophy of the soft parts and bones, or turgescence of the mucous membrane, and always an undue prominence of the inferior turbinated bone. J. N. Mackenzie, Roe, Daly, Hack, and Sajous hold that there exist in these cases both an unusual development and an unusual excitability of the mucous membrane covering a well-defined sensitive area, which is known to be coterminous with the inferior turbinated bone. According to these observers the symptoms of periodical catarrh are reflexes induced by irritation of this area, in cases which possess at the same time abnormal vaso-motor excitability, and hence J. N. Mackenzie proposes the name of coryza vasomotoria periodica for the disease.

The theory of these gentlemen, though revolutionary in character, has much to recommend it, and is found to be in strict accord with many of the observed facts in these cases. Yet in some respects it is not altogether satisfactory, especially when the question of periodicity is considered, or when regard is had to effects often noticed when a change of climate, or rather of place, is resorted to. Thus it is difficult to see how turgescence of the erectile tissue over the turbinated bone should occur, or, at any rate, produce serious effects, only at one season of the year. Then it is certainly going too far to account for the benefit secured at certain seashore places simply by the tonic effects of the sea air upon the nervous system, and to point to the well-established fact that a land breeze is injurious, and claim that it is so only so far as it is relaxing and enervating. At every place on the seashore there are alternating sea and land breezes; yet relief from autumnal catarrh is experienced at but few of them, and those that experience has proved to be suitable places of resort are such as by their topography receive no breeze from the land until it has passed over a considerable expanse of water.

But these observers, while maintaining the anatomical and nervous basis of the disease, do not deny that pollen may be one source of irritation among many others, and even should the theory they propose not be at present reconcilable with all the facts in any given case, it is reasonable to anticipate that further observation and closer study may tend to complete elucidation of it. Hitherto there has been nothing more definite than the supposition that the affection was produced by one or more kinds of pollen acting upon a personal idiosyncrasy —the latter term, of course, being only a convenient expression to cloak ignorance. This theory has been upheld by the majority of writers in the past, and is still contended for by Morell Mackenzie, Blackley, and many others. According to these writers, at a given season there is a large amount of pollen grains afloat in the atmosphere, which serve as the exciting cause, in cases possessing that personal peculiarity or idiosyncrasy wherein lies the true essential characteristic of the disease. When tested by experience the theory is found to fit in almost every particular.

That there is some peculiar atmospheric condition present only at a given season would seem to be proven by the fact that in the vast majority of cases there is an entire absence of symptoms at all other times. That this condition is imparted from the vegetable kingdom would seem proven, because almost all cases are benefited by a