

CLIMATE OF PORTLAND, OREGON, LATITUDE, 45° 32'; LONGITUDE, 122° 43'. PERIOD OF OBSERVATION, TWELVE YEARS.

	January.	March.	May.	July.	September.	October.	November.	Spring.	Summer.	Autumn.	Winter.	Year.
Temperature, Degrees Fahr.—												
Mean average temperature.....	39.6°	47.3°	56.0°	66.2°	60.9°	53.0°	45.1°	51.5°	64.2°	53.0°	41.0°	52.4°
Average daily range.....	10.8	16.2	20.5	21.9	20.0	14.2	12.3					
Mean of warmest.....	45.2	55.8	67.4	76.8	70.7	59.2	51.4					
Mean of coldest.....	34.4	39.6	46.9	54.9	50.7	45.0	39.1					
Highest or maximum.....	58.0	76.5	86.0	95.5	90.0	79.0	68.0					
Lowest or minimum.....	3.0	25.5	33.0	46.0	39.0	31.0	22.5					
Humidity—												
Mean average relative.....	78.4%	75.9%	64.9%	63.7%	69.2%	77.6%	78.4%	70.3%	65.1%	75.1%	78.7%	72.3%
Precipitation—												
Average in inches.....	7.34	7.27	2.44	.71	1.62	4.95	7.37	13.19	3.34	13.94	23.72	54.18
Wind—												
Prevailing direction.....	S.	S.	N. W.	N. W.	N. W.	S.	S.	S.	N. W.	S.	S.	S.
Average hourly velocity in miles.....	6.0	5.1	4.8	4.7	4.2	4.1	4.5	4.9	4.5	4.3	5.3	4.7
Weather—												
Average number clear days.....	3.4	4.4	5.1	15.3	12.4	7.1	4.7	14.7	37.0	24.2	9.6	85.5
Average number fair days.....	7.0	7.0	9.9	7.4	9.5	9.9	8.8	26.1	26.4	28.2	21.1	111.8
Average number clear and fair days.....	10.4	11.4	15.0	22.7	21.9	17.0	13.5	40.8	63.4	52.4	30.7	187.3

the climatic conditions characteristic of Portland, Ore., and those prevailing along the western coast of the European continent. The temperatures of the Oregon coast, he says, are strongly suggestive of those found throughout northwestern Europe; further, the almost rainless summer with heavy winter rainfall is a feature of climate in which the Oregon coast resembles the Mediterranean basin rather than the more northerly parts of Europe.

Edward O. Otis.

**PORTSMOUTH, N. H., AND ADJACENT RESORTS.**

—This "old town by the sea" is noticed here not only on account of its own attractions, but because in its vicinity are a number of well-known summer marine health resorts: the Isles of Shoals; Rye and Hampton Beaches and Little Boar's Head; York Harbor and Beach; Ogunquit, Passaconaway, Kittery, and Newcastle.

Portsmouth, fifty-seven miles from Boston, is situated a few miles above the mouth of the Piscataqua River, and possesses an excellent harbor. It is the only seaport of New Hampshire, and in the days of wooden ship-building was a very prosperous town, as is evident from the stately mansions still remaining there.

The present population is about ten thousand, and the town presents a quiet, tranquil aspect quite in contrast to its by-gone activity when ships were launched from its yards and were entering and departing from its spacious harbor. The streets are beautifully shaded, and the old residences of the architecture of seventy-five or a hundred years ago, with their attractive gardens, together with the water views from the decaying wharves, all combine to give this old city a most picturesque appearance. There are also many points of historic interest in and about the city, for it was first settled in 1623. On an island opposite, in the town of Kittery, is the United States navy yard. There are no meteorological observations to be had in regard to Portsmouth, but a fairly accurate idea of the climate may be obtained by striking an average of the climatic data of Boston and Portland, which are on the coast fifty miles east and west of Portsmouth, and which differ but little from each other. Estimating in this manner we have the following figures: Mean average yearly temperature, 47.3° F. Mean average temperature for the four seasons: spring 44.1°, summer 68.1°, autumn 50.3°, winter 26.8°.

The annual mean relative humidity of Portland and that of Boston are almost identical, and that at Portsmouth is, therefore, probably the same, which is 69.6 per cent., varying but little during the year. The average number of clear and fair days is: spring 58.3, summer 65.6, autumn 61, winter 59.6; year, 244.7. The yearly rainfall is 43.6 inches. The prevailing wind is from the southwest and west. All along this coast there may be a few very hot days during the summer, but generally the air is cool and delightful, and the sea breeze is almost a daily occur-

rence. The accommodations are good, among them one very excellent first-class hotel. Although Portsmouth is a city, yet it is such a mild and quiet one that it offers many advantages for even a whole summer's sojourn. The society is exceptionally good, to which the adjacent navy yard makes valuable contributions; the air pure and cool; the scenery in the vicinity very attractive, and there are many excursions both by land and water. There are various churches, one the historic old St. John's, a good library, a well-equipped hospital, and excellent physicians. Frequently some of the vessels of the North Atlantic Squadron visit Portsmouth during the summer, and there are always one or more warships at the navy yard.

The water supply of Portsmouth is from springs and driven wells a few miles from the city, and is regarded as of excellent quality. Sewers emptying into tide water are being slowly introduced, although many of the old-time vaults still remain.

The average yearly mortality for the last eight years (1894-1901) is 19.25 per thousand.

An old resident and practitioner of Portsmouth assures the writer that the sanitary condition is good, and that there are very few cases of sickness which can be attributed to unsanitary conditions.

One is referred to the writings of T. B. Aldrich, Lowell, and Mrs. Celia Thaxter for charming accounts of Portsmouth and the Isles of Shoals.

**Newcastle.**—This small island at the mouth of the Piscataqua River, about two miles from Portsmouth, is a popular summer resort, with a large hotel, boarding-houses, and cottages. The situation of Newcastle is very picturesque, and it has a beautiful and extensive ocean exposure. It is connected with the mainland by bridges, and has frequent communication with Portsmouth by land and water. There are opportunities for golf, tennis, boating, and bathing. There is a military garrison at Fort Constitution. The climate is the same as at Portsmouth, with the exception that being directly on the ocean, it is more peculiarly marine.

**Kittery Point,** at the mouth of the Piscataqua River, opposite Newcastle, is very attractively situated and is a popular summer resort, affording good accommodations, both in hotels and cottages. It has frequent communication with Portsmouth both by trolley and by boat.

**Isles of Shoals.**—This group of small, rocky islands lies about nine miles off the coast, and has communication in the summer with Portsmouth several times a day by a comfortable steamer, the voyage occupying about an hour. Appledore is the largest of the group, which consists of eight islands, and contains two hundred and fifty acres. The formation of these islands is granitic, and they present a rugged picturesque appearance, barren, and with very sparse vegetation. Huge, irregular reefs jut out into the ocean, and after a storm the play of the

surf is very imposing. Only two of the islands provide accommodations for summer residents, Appledore and Star Island, there being extensive hotels on both islands. The accommodations are rather more elaborate and expensive on the former (Appledore), and there are several cottage annexes. These islands have been a popular summer resort for many years, owing to the cool, equable marine climate found there, with an absence of dust and flies. Here one can experience all the climatic influences of a sea voyage without the discomforts incident to ship life. They are far enough removed from the mainland to be free from all contaminating influences, and from whatever quarter the wind blows it brings pure air. From a "weather record" for the summers of 1897-98 (June 25th to September 15th) kindly furnished the writer by Dr. J. W. Warren, who has been a summer resident of Appledore for over twenty years, the following data are condensed:

Mean temperature (Fahrenheit scale) from two daily observations at nine and four o'clock. June (25th to 30th) 63.2°, July 65.7°, August 67°, September (1st to 15th) 64.8°. The maximum temperature for this period was: June (25th to 30th) 70°, July 81°, August 78°, September

can be reached from the latter place by steam railroad, or by ferry, and a most attractive trolley ride. York Harbor is the principal resort, and enjoys a wide popularity. Cottage life predominates, although there are several good hotels. The coast is bold and rocky, and the York River winds inland for some nine miles, and has a large flow of tide water. The residential portion of the town is built upon ledges with little or no subsoil, so that there is good surface drainage, aided by the natural declivity of the land toward the sea. Further inland are wooded districts and tillage lands. The climate is a particularly stimulating one, favorable for convalescents, for whom a marine climate of this nature, combined with sea bathing, is desired. The air is generally cool and the temperature equable, an extremely hot or cold day in the summer being rare. Fogs are unusual. The following climatic chart was obtained through the kindness of Dr. Seabury W. Allen, a summer resident of York Harbor, as also much of the information contained in this account. The prevailing wind is southwest to southeast during the summer months, and is only exceptionally of sufficient velocity to interfere with canoeing or sailing.

CLIMATE OF YORK HARBOR—PREPARED BY DR. SEABURY W. ALLEN.

	June.	July.	August.	September.	October.
Temperature, Degrees Fahr.—					
Average or normal.....	62.3°	69.9°	65.8°	58.4°	} For three years, 1897-1899.
Highest or maximum.....	82.3	87.3	87.3	79.3	
Lowest or minimum.....	45.0	51.6	48.3	39.6	
Precipitation—					
Mean annual precipitation for twenty-five years, 40 to 50 in.					
Mean monthly average rainfall (April to September) twenty-five years, 3.4 in.					
Average number of days in which rain fell (for three years).	11	9	7	9	
Average daily temperature (for nine years).....	8 A.M.—67 8 P.M.—68	8 A.M.—67 8 P.M.—67	8 A.M.—65 8 P.M.—70	8 A.M.—56 8 P.M.—57	8 A.M.—45 8 P.M.—46

(1st to 15th) 80°. Minimum, June (25th to 30th) 56°, July 56°, August 53°, September (1st to 15th) 56°. The summer temperature is said to be several degrees cooler than it is on the coast. Cold, raw days are infrequent, and the difference in temperature between day and night is slight, so that one can generally sit out in the evening. In general, the variations in the temperature are never as pronounced as on the mainland.

The average number of fair days for the two years was: June (25th to 30th) 4, July 15, August 17, September (1st to 15th) 9. Number of partly cloudy, misty, or foggy days: June (25th to 30th) 2, July 13, August 10, September (1st to 15th) 2. Partly rainy or rainy days: June (25th to 30th) 1, July 1.5, August 1.5, September (1st to 15th) 1.5.

The prevailing summer winds are southwest and south-southwest, and are not generally high. Fogs are not so prevalent as farther east, although they occasionally occur. The average number of rainy days is said to be much less than at Portland or Boston.

Therapeutically this climate has been found to be of great benefit to convalescents and to certain cases of neurasthenia. It is peculiarly valuable for those who, for one reason or another, wish to be much in the open air and at rest, for there are few inducements or opportunities to take exercise. Many years ago the late Dr. H. I. Bowditch considered the summer climate of these islands favorable for early cases of pulmonary tuberculosis, and they surely possess the requisite of pure air. Many cases of hay fever find immunity here. On White Island is a lighthouse, a prominent object from the mainland. There is good sea fishing and sailing about the islands. A steam launch affords frequent communication between Appledore and Star Island.

For much of the above information the writer is indebted to Dr. J. W. Warren.

**York Harbor and Beach.**—These resorts, on the Maine coast, are about nine miles distant from Portsmouth, and

Thunder storms are frequent in summer, but a continuously rainy day is the exception. The water supply is excellent; it is obtained from an inland lake some five miles distant. The ice, milk, and farm produce are also of good quality. The larger houses and hotels have sewers running into the sea, the smaller ones either connect with one of these sewers or have cesspools of their own.

So far as known there have been no cases of illness attributable to imperfect drainage. Indeed, this resort enjoys almost complete immunity from zymotic and infectious diseases. Gastro-intestinal disorders, especially in children, are rare. Such a climate, or indeed any cool marine one, is obviously not suitable for patients suffering from rheumatism, bronchial and pulmonary affections.

**York Beach,** situated a few miles to the eastward of York Harbor, possesses essentially the same characteristics as the latter, with the exception of the drainage. Here, on account of an extended swamp, lying behind the beach shingle, and which is imperfectly drained, there is always more or less stagnant surface water, and for this reason this locality is not so desirable as a place of summer residence.

Several miles beyond York Beach and to the northward is the Passaconaway Inn, on a rocky promontory, affording good accommodations, and still farther along the coast is the extensive Ogunquit Beach, reaching toward Wells.

**Rye Beach.**—This well-known and favorite summer resort is eight miles distant from Portsmouth by electric road, and is also easily reached from Boston by rail to North Hampton and thence by trolley. The air is warmer than on the Maine coast, but is fresh and cool, with an almost daily sea breeze. Moreover, the humidity (about seventy per cent.) is considerably less than at many other marine resorts. The majority of summer days are clear or fair, and the rainfall at that season is moderate. The general healthfulness of this resort is noteworthy, and children especially thrive here. The rapidity with which delicate and sickly children improve in this climate is often quite remarkable. It is also fa-

avorable for the aged and delicate persons and convalescents from various diseases. The surf bathing is good, although the water is cold, averaging about 60° to 65° F. during July and August.

The drives are very delightful, over good country roads, and through pleasant pastoral scenery. An ocean boulevard extending along the whole coast of New Hampshire is in process of construction at Rye Beach, and when completed will afford an exceedingly attrac-

sage separates the island from Hayti, and on the east lie the Virgin Islands and Saint Thomas. Porto Rico is about 1,000 miles southeast of Florida, and about 1,500 miles from New York City. The shape of the island is that of an elongated quadrangle, its long axis running east and west. The greatest length of the island is 108 miles and its average breadth is 37 miles. The estimated area is 3,600 square miles, or about 1,000 square miles greater than that of the State of Delaware and 1,300 square

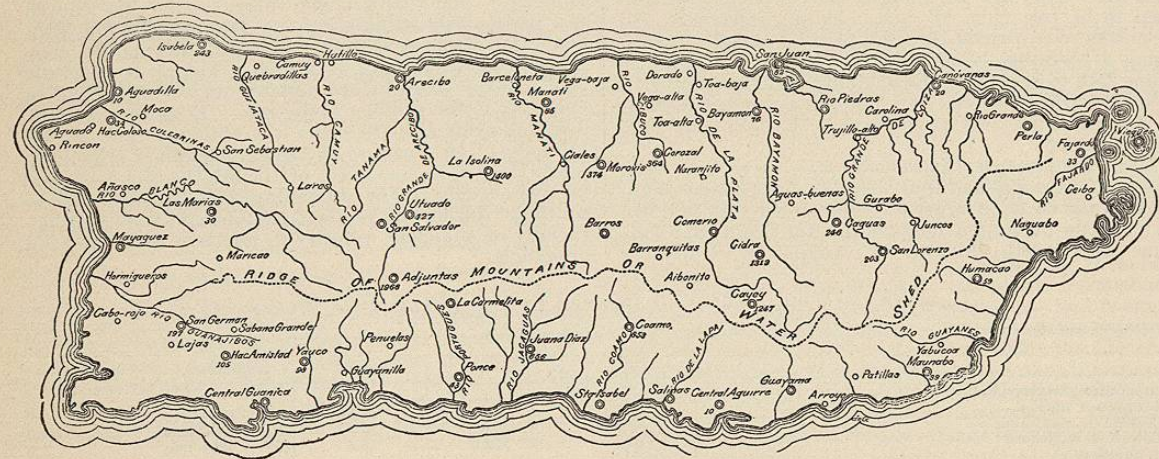


FIG. 3878.—Island of Porto Rico. (Figures near names of places indicate altitude in feet.)

tive drive of about eighteen miles from the Piscataqua River, on the north, to Hampton River on the south.

There are well-kept golf grounds with an attractive club-house, and a picturesque stone Episcopal church near the water, "St. Andrew's by the Sea." The sanitary conditions are generally good, and all the hotels and large boarding-houses have sewers running to the sea. The water supply is from springs, artesian and surface wells. The accommodations are excellent, though rather expensive, and there are many social attractions. Cottage life here as well as at the neighboring Little Boar's Head has become quite an important feature.

Little Boar's Head, situated about a mile south of Rye Beach, possesses the same characteristics as the latter. The name is derived from the bluff upon which it is situated. The views over the marshes and toward the sea are particularly charming. The accommodations and class of visitors are quite like those at Rye Beach. Indeed, both from its contiguity and identity of interests, Little Boar's Head can be regarded as a portion of Rye Beach. It is reached by trolley from Portsmouth or from Boston by railroad and trolley.

Hampton Beach.—Although not so fashionable as Rye Beach, this is a much-frequented resort, with several hotels of moderate price and fair accommodations, and many small cottages stretching along the beach. There is a long, hard, sandy beach extending for some miles, and affording excellent surf bathing. In the rear of the beach are extensive marshes. There are many attractive drives in the vicinity, although the wooded and cultivated land does not approach the water so closely as at Rye Beach.

This is a favorite resort for excursions, and consequently might not be so attractive to the permanent guest. It is reached by electric road from Portsmouth and Exeter, and is within three miles of the steam railway.

**PORTO RICO.**—Porto Rico (*Spanish*, Puerto Rico), aboriginal name Borinquen, in size the fourth island of the West Indies, is situated between latitudes 17° 50' and 18° 30' north, and longitudes 65° 30' and 67° 15' west, Greenwich. On the north is the Atlantic Ocean, on the south the Caribbean Sea, on the west Mona pas-

sage separates the island from Hayti, and on the east lie the Virgin Islands and Saint Thomas. Porto Rico is about 1,000 miles southeast of Florida, and about 1,500 miles from New York City. The shape of the island is that of an elongated quadrangle, its long axis running east and west. The greatest length of the island is 108 miles and its average breadth is 37 miles. The estimated area is 3,600 square miles, or about 1,000 square miles greater than that of the State of Delaware and 1,300 square miles less than that of Connecticut. In appearance Porto Rico is an agglomeration of hills and mountains channelled with innumerable steep and narrow valleys. The hills and mountains abut more or less abruptly on the ocean, with but here and there an intervening strip of flat or gently sloping shore. Notwithstanding the striking unevenness of the island, there is a definite orographic system traced as a sinuous crest from near the southwestern corner eastwardly, and about one-third nearer the southern coast than the northern. In the eastern part of the island this crest bends sharply and terminates near the northeast extremity of the island in the peak, El Yunque, 3,609 feet above sea-level, the highest point in Porto Rico. The general elevation of this crest ranges from 2,000 to 3,000 feet above sea-level, with here and there a pass somewhat lower or a peak somewhat higher. From this general crest the mountains and hills decline coastward. The coastward fall is much greater toward the south as a consequence of the proximity of the mountain crest to the southern coast. This crest divides the island into practically two watersheds, the larger one draining north and west, the smaller draining south and east. Flowing down these two sheds, rapidly and often precipitously, are more than thirteen hundred named streams. But few are navigable, and then only for a few miles. The coast, unlike that of Cuba, has but few fringing reefs to interfere with the close approach of vessels to the shore. There are a number of good natural harbors. San Juan, on the north, is the most important commercially. It now has a depth of twenty-nine feet in the roadstead and twenty-two feet at the wharves. Other ports that may be entered by the average ocean-going vessels are Arecibo, Aguadilla, Mayagüez, Guanica, Arroyo, and Fajardo. When it is considered that the total coast line is not much more than three hundred miles, Porto Rico appears well provided with harbors. Viquez, a small inlet off the east coast, has two excellent harbors.

**Geology.**—Though one of the earliest colonized islands of the New World, practically nothing is known of the geology and mineral resources of Porto Rico. The early Spanish settlers worked some placer gold, and some is still to be found in the rivers of the northeast part of the

island. Mercury, magnetic iron ore, copper, coal, salt, and several other minerals are found, but till a systematic survey is made no estimate of the actual importance of these minerals and of others not mentioned can be given. Several thermal and mineral springs, and one or two caves of interesting formation and beauty are known.

**Fauna.**—The indigenous mammalian fauna have practically disappeared with the exception of a few species of rodents, of which the only peculiar one is the somewhat squirrel-like agouti (common also to all the other West Indies). A number of bats are found. The curious marine mammal, the manatee, frequents the shoal waters of the coast. Fish, both fresh- and salt-water varieties, are plentiful. Noxious reptiles are said not to exist, and insect pests are not over-plentiful. The usual domestic animals thrive well, and good beef is to be had throughout the island.

**Flora.**—Vegetable life flourishes even to the tops of the highest peaks. However, it is now only on the more inaccessible mountain slopes and tops that considerable remnants of the once large indigenous forests are found. Some of the native woods possess properties that are peculiarly suitable for certain purposes, but their scarcity precludes their general use. Intelligent reforestation would seem to offer returns of commercial value. Among the many native trees, Baron Eggers describes a beautiful talauma with immense white odorous flowers and silvery leaves, a bertella with crimson flowers, an unknown tree with orange-like foliage and large purple flowers, and most conspicuous of all, the Cocoloba macrophylla, with its great purple spikes of more than a yard long. Of woods common to other of the West Indies, there are found hard and soft Spanish cedar, sandalwood, and ebony. Tree ferns are numerous and of large size. The absence of epiphytes is in striking contrast to their abundance in the forests of the neighboring islands. Coffee, of excellent quality, sugar cane, yams, oranges, coconuts, and many of the other tropical fruits are cultivated and yield well. A species of rice, requiring no irrigation, is found growing upon the highlands, and forms one of the staple foods of the laboring class. An excellent grass, *Hymenachne striatum*, covers the lowland pastures, and on it is fattened the beef for which Porto Rico is esteemed by its neighboring islands.

**Climate.**—Though somewhat nearer the equator than Cuba, Porto Rico is not correspondingly warmer. On the contrary its temperature, taken as a whole, is slightly more comfortable. This is due to the situation of the island farther out in the ocean, and at the windward angle of the Antillean system. This position, combined with its slightly more southern latitude, gives it the unobstructed flow of the northeast trades at all seasons of the year. Porto Rico, again compared with Cuba, owes somewhat of its more agreeable temperature to its smaller size, giving it a nearer approximation to the true marine air temperature of its latitude. The only statistical data of value in determining the climate of Porto Rico are the

observations made by the United States Weather Bureau station at San Juan. This station was established late in 1898. At the same time a number of what are now known as voluntary stations were established, but the data furnished by them are not yet accurate enough to be of much use, climatologically. The table given below shows the principal climatic values for San Juan, as determined from four years' observations.

**Temperature.**—A record of temperature was kept by the Jefutura de Obras Publicas, prior to American occupation of the island, but it does not present on its face that evidence of accuracy that well-kept meteorological records exhibit. However, the results are given that they may be compared with those of the annexed table. The average annual temperature for twelve years was 78.9°; the highest recorded temperature 100.8° and the lowest 56.1° F.

The hottest season of the year is from July to October, inclusive, with an average temperature of 80° to 81°. The coolest season is from December to March, inclusive, with an average temperature of 75° to 77°. It appears probable that this regimen holds for the island generally. Local differences in altitude and exposure should be taken into consideration as affecting the numerical size of the values given. If we take two interior stations, Cayey, 1,205 feet elevation, and Adjuntas, 1,970 feet elevation, the records of which, though broken, may still give an approximation of the inland temperature, we shall find that the average seasonal temperatures are from two to six degrees lower than those of San Juan. The highest temperature in three years at Cayey was 97°, and at Adjuntas in the same years 92°. The lowest recorded was 52° at both places. At San Juan the average diurnal range of temperature is about 10° to 11°, and at the two other stations it appears to be about 20°. Cayey is in the east central part and Adjuntas in the west central part of the island.

**Rainfall.**—The average yearly rainfall at San Juan for four years was 75.52 inches. From the records of the Spanish authorities before referred to it appears to have been 61.2 inches. Fair records of the rainfall in other parts of the island are not yet to be had. However, there is no doubt that the rainfall varies greatly, even in localities but few miles apart. The rainfall is much greater on the northern watershed than on the southern, and much greater on the northeastern part of the first-named shed. Generally speaking, the rainfall is everywhere greater on northeast exposures. On the southern watershed there are many localities where the rainfall is insufficient for the tropical vegetation and barren tracts are not uncommon. Irrigation is necessary in many localities on this shed.

The greatest amount of rain falls from May to October. The months of February and March are comparatively dry, February noticeably so at San Juan. In Porto Rico, as in other tropical regions, the greater part of the rain falls as an accompaniment of the almost daily thunder storm. The usual cloud regimen is clear skies in the

SHOWING CERTAIN CLIMATIC FACTORS FOR SAN JUAN, PORTO RICO; AVERAGE OF FOUR YEARS' OBSERVATIONS.

Stations.	Jan.	Feb.	March.	April.	May.	June.	July.	August.	Sept.	Oct.	Nov.	Dec.	Annual.
Temperature, Degrees Fahr.													
Average monthly.....	75°	76°	76°	78°	79°	80°	80°	81°	81°	80°	78°	77°	78°
Average maximum.....	81	82	82	83	85	85	86	87	86	84	82	84	84
Average minimum.....	70	70	70	72	73	74	75	75	74	73	71	73	73
Highest (absolute).....	86	89	89	93	93	91	89	91	90	89	88	83	83
Lowest (absolute).....	66	66	66	66	68	70	70	71	68	65	65	65	65
Humidity—													
Average relative.....	81%	76%	74%	76%	80%	82%	81%	80%	82%	83%	81%	80%	80%
Rainfall (inches)—													
Average monthly.....	5.92	0.88	3.14	4.80	6.31	8.51	7.33	7.66	8.03	8.87	9.48	4.56	75.52
Greatest fall in 24 hours.....	3.07	.70	2.08	4.34	4.81	2.46	4.05	6.26	3.76	3.35	2.93	2.02	
Average number rainy days.....	20	8	15	13	17	22	23	18	17	21	18	17	
Sunshine—													
Percentage of possible.....	64	72	68	65	60	56	57	66	61	58	61	63	63
Wind—													
Prevailing direction.....	E.	E.	E.	E.	S. E.	S. E.	E.	E.	S. E.	S. E.	E.	E.	E.
Average hourly velocity (miles per hour).....	10	9	11	10	9	10	12	11	9	7	8	9	10

morning, cloudy in the afternoon, and clearing and clear at night.

*Wind.*—The prevailing winds are remarkably constant from the east or between northeast and southeast. The velocity is steady and averages ten miles an hour. It is subject to a regular diurnal range, rising gradually to a maximum at the hottest part of the day and subsiding from that time to a minimum at the coolest part of the day, just about sunrise. This regularity and steadiness of the wind cannot be over-estimated in its relation to the comfortable habitability of Porto Rico.

*Storms.*—Though visited August 8th, 1899, by one of the most destructive storms of recent years, the island is well to the east of the usual tracks of West Indian hurricanes. Thunder storms, though of almost daily occurrence and accompanied by great electrical display, are not destructive, and one soon becomes used to their apparent violence.

*History.*—Porto Rico was discovered by Columbus in 1493. The first settlement was made by a party of Spaniards under the leadership of Ponce de Leon, at Caparra, A. D. 1510, but it was shortly afterward abandoned. San Juan was founded by the same leader in 1511. The town was sacked by the English under Drake in 1595, and again under the Earl of Cumberland in 1598. Since then it has successfully withstood the assaults of the Dutch in 1615, the English in 1678 and in 1797, and the United States in 1898. On July 25th, 1898, the island was invaded by the United States forces, who landed without opposition at Guanica on the southern coast. Only a feeble resistance was subsequently encountered. The Spanish formally evacuated the island October 18th, 1898. By the treaty of Paris, December 11th, 1898, Porto Rico was ceded to the United States. A census taken by direction of the War Department, 1899, gave a total population of 953,243 inhabitants. Unlike most, if not all, the other West Indian islands, Porto Rico has a larger white than black population. In 1899 there were 589,426 whites and 363,817 blacks. The density of population is also great, averaging 264 persons to the square mile, a density equal to that of New Jersey and twice that of Pennsylvania. The greater part of the population is rural. The population of the largest cities in 1899 was: San Juan 32,048, Ponce and its port 27,952, Mayaguez 15,187, and Arecibo 8,008. The ratio of illiteracy is high, but twenty-three per cent. of the population over ten years of age being able to read. Agriculture, such as it is, is the chief occupation, employing about sixty-three per cent. of the working population. The most important products are coffee, sugar, and tobacco. The total value of exports from July, 1898, to December, 1899, was \$11,621,049. The imports during the same period amounted to \$12,654,542. Transportation facilities before American occupation were poor. There existed but one hundred and thirty-seven miles of railroad, and with the exception of the excellent military road from San Juan to Ponce, and a few connecting branches, there were no common roads at all. Much has been done since to improve matters in this respect. The sanitary conditions were equally in keeping with the general indifference shown in other improvements. Few, very few, houses had any efficient sewage disposal systems. In many the systems were even worse than none, being in their ultimate workings actually pernicious. The average death rate, calculated from reported deaths for eleven years, is 30 per thousand. There is reason to think that this is considerably less than the actual. The chief causes appear to be: Anemia, 22.50 per cent.; tuberculosis, 6.78; diarrhoeal diseases, 3.83; cerebrospinal meningitis, 1.12; typhoid fever, 1.43; tetanus, 3.57. Smallpox was, prior to 1899, one of the chief causes of mortality, averaging annually 623 deaths. It is now, happily, no longer a factor of importance, owing to the thorough vaccination of the entire population carried out by the United States military authorities. Yellow-fever epidemics have occurred occasionally. The large mortality from anemia appears to be due to the general infection of the drinking-water by the intestinal para-

site, ankylostomum duodenale. Ordinary care exercised in filtering or otherwise purifying the water used for culinary and drinking purposes should be followed by a great reduction in this disease.

W. F. R. Phillips.

POST-MORTEM EXAMINATIONS. See *Autopsies*, and *New-Born*, *Pathology of*.

**POTASSIUM.**—I. GENERAL MEDICINAL PROPERTIES OF COMPOUNDS OF POTASSIUM.—In its physiological relations potassium is the most individual of the alkali metals, producing effects sufficiently pronounced to be seen characteristically in the case of all its compounds that are capable of absorption. Such effects are as follows: Locally, potassic compounds are irritant—less so than the average of soluble compounds of the heavy metals, but yet sufficiently so to make a large portion of a strong solution of a potassic salt dangerous on the score of irritation alone. In the intestines, potassic salts tend to increase the secretion of fluid, so that salts of this base that are of low diffusion power prove watery purges. Constitutionally, the prominent effects are certain derangements of function and certain effects that find their simplest explanation in the assumption that potassium quickens the rate of oxidation within the organism as it does in laboratory experiments. The derangements of function are, first, an enfeeblement of the heart's action, passing, in poisonous dosage, to permanent arrest in diastole. The effect seems to be due, as results of all experimentation agree, to a directly paralyzing influence upon the musculature of the organ itself. Secondly, but requiring relatively larger dosage, there follows general motor paralysis, voluntary and reflex. This effect is proportionately much more strongly marked in cold-blooded than in warm-blooded animals, and, in therapeutic dosage in man, is practically not seen at all. It is probably accomplished by an action on nerve centres, nerve trunks, and muscles conjointly, but an action which is most intense upon the nerve centres and least so upon the muscles.<sup>1</sup> The effects commonly assigned to a quickening of oxidation are, in the healthy, an increase in the solid excreta of the kidneys, with a proportionate increase in the volume of the urine, and, in the lithemic individual, a diminution in the amount of uric acid excreted, with a simultaneous increase of urea and appearance of calcium oxalate. These effects in lithemia are translated to mean an oxidation of much of the uric acid into oxaluric acid, which product then splits into urea and oxalic acid.<sup>2</sup> In large doses, long continued, potassic compounds prove noxious to nutrition, the blood becoming thin and unduly fluid, newly formed and lowly vitalized tissues, such as cheesy deposits, tending to liquefy, and health and strength generally to suffer. Therapeutically, the effects of applications of potassic compounds, determined by the potassium element of their composition, are to depress the heart in sthenic fever, to oppose the lithic diathesis, and to provoke catharsis or diuresis. Other uses are derived from individual peculiarities of the different compounds.

II. THE COMPOUNDS OF POTASSIUM USED IN MEDICINE.—The compounds of potassium official in the United States Pharmacopœia divide, for purposes of study, into two groups—the one embracing compounds whose effects are either derived from the potassium or are *sui generis* to the salt, and the other such as owe their effects mainly to the acid radical of their composition. The members of the former group, which alone will be discussed in this place, are the *hydroxide*, *carbonates* (normal and acid), *citrate*, *acetate*, *tartrates* (acid and potassio-sodic), *sulphate*, *nitrate*, and *chlorate*. The second category comprises the *hypophosphite*, *bromide*, *iodide*, *sulphide* (in the preparation, *potassa sulphurata*), *acid chromate*, *cyanide*, *ferrocyanide*, *permanganate*, *arsenite*, (in the preparation, *liquor potassii arsenitis*), *potassio-aluminum sulphate* (alum), and *potassio-ferric tartrate*. For discussion of these compounds see, severally, *Hypophosphites*, *Bromides*, *Iodides*, *Sulphides*, *Chromium*, *Cya-*

*nides*, *Ferrocyanides*, *Manganese*, *Arsenic*, *Aluminum*, and *Iron*.

*Potassium Hydroxide* (Potassium Hydrate): KOH. This is the compound which is both commonly and officially known as *Potassa*, *Potassa*, called also *caustic potash*. It is obtained first in aqueous solution by precipitating with lime a solution of acid potassium carbonate. Such aqueous solution, when rapidly boiled down, yields a fluid of oily consistence—simply the hydroxide melted by the heat—which, poured into cylindrical paper moulds, hardens on cooling into the cylindrical sticks in which form potassa is commonly met with. Potassa thus obtained is a white, hard substance, having a faint alkaline odor, and a very harsh, caustic taste. It is exceedingly deliquescent, and readily soluble in water and alcohol.

Beside the stick form, potassa is official in five per cent. aqueous solution under the title *Liquor Potassæ*, Solution of Potassa. This solution is made as just described, and is a clear, colorless liquid, odorless, but with the acrid, caustic taste of potassa. It should be kept in green glass bottles, glass stoppered, and the stoppers should be coated with vaseline or a thin layer of melted paraffin. Specific gravity about 1.036.

Potassa produces physiological effects which spring in part from an intense affinity for water, in part from its powerful alkalinity, and in part from its operation as a compound of potassium. Locally, in concentrated application, potassa is intensely caustic. A moistened stick swept even lightly over a tender surface produces speedy corrosion, which extends finally beyond the area of original application, the tissues breaking down widely into a brownish, slimy, pulaceous material. Taken internally, therefore, in strong solution, potassa is a corrosive poison. In such poisoning, the acrid, alkaline taste of the potion is followed immediately by severe pain in the pharynx, œsophagus, and epigastric region. These symptoms are in turn speedily succeeded by violent vomiting, where the ejecta have the greasy aspect and pulaceous consistency of tissues corroded by potassa, and prove strongly alkaline to test paper. The mucous membrane of the lips, mouth, and throat may be bright red from irritation, if the solution swallowed were not overstrong, or may, in the case of strong potions, show direct corrosion, being covered by a brownish film having a greasy or soapy feel. Loss of voice and extreme difficulty of swallowing are exceedingly common, but intestinal symptoms are generally wanting. Constitutionally, the symptoms are those of shock, from the suddenness and severity of the corrosion. In survival from serious grades of the poisoning, stricture of the œsophagus is a very common sequel. In the treatment, the only peculiar feature is to give harmless acids to neutralize the alkali, but since the damage is generally already fully done before the physician arrives, this chemical neutralization rarely avails for much. Vinegar or lemon juice are the acids most available, from their being strong but non-corrosive themselves, and at the same time readily procurable. Locally applied, in non-corrosive strength, potassa operates as a powerful and harsh alkali. Acids are neutralized, grease becomes saponified, epithelial tissues swell and soften, and acid secretions, such as the gastric juice and the sweat, tend to be called forth. Upon the skin, potassa lotions cleanse from dirt or the crusts of dried secretion and epithelium resulting from skin disease. Taken internally, the remedy excites appetite and increases the flow of the gastric digestive fluid, or in cases of fermentation of the food neutralizes acidity and so relieves the heartburn and nausea which such acidity excites. Constitutionally, medicinal doses of potassa produce, of course, the effects of all potassium compounds as already set forth, and also, because of free alkalinity, tend to neutralize morbidly developed acid in the blood or tissues, to diminish the acidity of the urine, or even to reverse the reaction of that secretion to the alkaline. Probably in part because of the peculiar action of potassium as such, and partly because of the alkalinity of potassa, this compound is of special efficacy in the diatheses leading, severally, to

rheumatism, gout, and lithæmia, and in the skin diseases urticaria, psoriasis, eczema, lepra, acne, and recurring boils.

The medical uses of potassa are for the purposes above detailed, yet, except as a caustic, it is not so much used, simply because it is rough and harsh, while at the same time other and milder potassic compounds are equally efficient. Thus for direct local alkaline action the carbonates, and for constitutional alkalinizing, the citrates and tartrates, are respectively preferable.

To *cauterize* with potassa, the adjacent parts should be protected by adhesive plaster, and the doomed area, if covered by skin, should then be rubbed with a moistened stick of the caustic until discoloration appears. If the part be a mucous membrane or raw tissue, a single light sweep of the caustic is sufficient for even a profound cauterization. In no case should the agent be used where an exact limitation of the caustic effect is essential, as where the part to be destroyed is in close contiguity to important, or large, blood-vessels or organs. To render the corrosion of potassa less spreading, a mixture of equal parts of potassa and quicklime has been devised, and is official in the United States Pharmacopœia, under the title *Potassa cum Calce*. Potassa with Lime. This mixture, commonly known as *Vienna caustic*, is a grayish-white, deliquescent powder, soluble in hydrochloric acid. It is less diffusive in its action than potassa, by reason of the peculiar action of the lime of its constitution. For use the powder is made into a paste with a little alcohol.

For a potassa lotion, the solution of the Pharmacopœia is to be prescribed, diluted with several volumes of water. For internal giving, the same solution is employable, in doses ranging from 0.65 to 4 gm. (℥ x. to fl. ʒ i.) greatly diluted with some syrupy or mucilaginous fluid. But potassa, as an internal remedy, is very objectionable for any but a very temporary medication.

*Normal Potassium Carbonate*: (K<sub>2</sub>CO<sub>3</sub>)<sub>2</sub>.3H<sub>2</sub>O. The salt is official in the United States Pharmacopœia under the title *Potassii Carbonas*, Potassium Carbonate. It is a white, granular powder, very deliquescent, odorless, having a strongly alkaline taste, and an alkaline reaction. It is readily soluble in water, but is insoluble in alcohol. Potassium carbonate is so deliquescent that unless carefully put up in well-stoppered bottles it will eventually transform itself into an oily fluid, by dissolving in moisture attracted from the atmosphere.

Physiologically, potassium carbonate is simply a weakened potassa, yet not so weak but that, in strong solution, it may prove a corrosive poison. Its use is mainly in ointment or in aqueous solution as a strong alkaline potassic application in skin diseases. Ointments of the carbonate are made with lard, the strength ranging from two to ten per cent. Solutions of the salt for service as lotions range in strength from one-half to one per cent.

*Acid Potassium Carbonate*: KHCO<sub>3</sub>. The salt is official in the United States Pharmacopœia under the title, *Potassii Bicarbonas*, Potassium Bicarbonate. It occurs in colorless, transparent, prismatic crystals, and differs from the normal carbonate in being permanent in the air. It is odorless, and of a slightly alkaline taste and reaction. It is soluble in 3.2 parts of cold water and is decomposed by boiling water. It is practically insoluble in alcohol. It should be kept in well-stoppered bottles.

Physiologically, this carbonate is similar to the normal salt, but weaker. The taste is mild, though mawkish; the alkalinity feeble, and the salt is hardly capable of being corrosive. The uses are, locally, as an alkaline application in skin disease, in preparations such as are described above in speaking of the normal carbonate, and, internally, as a stomachic or constitutional alkali. But for stomachic purposes sodic salts are more agreeable, and for constitutional alkalinizing the potassic citrates and tartrates. If given internally, the dose ranges from 1 to 4 gm. (from gr. xv. to ʒ i.).

*Normal Potassium Citrate*: K<sub>2</sub>C<sub>6</sub>H<sub>5</sub>O<sub>7</sub>.H<sub>2</sub>O. This salt, formerly known as *Salt of Riverius*, is official in the