COFFEE.

By E. C. ROST.

On my visits to the world's greatest coffee-producing countries—among them Brazilian, Philippine, Hawaiian, Cuban and Puerto Rican coffee fields—I learned some facts which may be of interest. Little is known of the early history of coffee, though it has been in use for more than 1000 years. Prior to the eighteenth century all the coffee used in Europe was brought from Arabia Felix via the Levant. This trade was broken up when the vessels of England and Holland doubled the Cape of Good Hope. In 1697 Van Horn introduced coffee into Batavia; from there it was taken to France and from there to Martinique and other of the West Indian Islands. In 1754 Fr. Villaso, a Franciscan monk, took a plant to Rio Janeiro and cultivated it in the garden of the monastery of St. Anthony. The origin of the name is somewhat obscure; it has been said to come from Kahwah, an Arabic word, but this seems to be somewhat far-fetched, as coffee did not originate in Arabia, and it doubtless had a name when it was brought there. In all probability the word is derived from Kaffa, the name of a province in Abyssinia, where it is found in a wild state. The coffee plant belongs to the genus *Coffea*, order *Rubiceæ*, and is related to the Cape Jasmine, and also to the little spring "Bluet" of our pastures. It was my privilege to study the coffee industry in many parts of the world, but not until traveling through Brazil did I realize the tremendous effect of this article upon the world's commerce.

We know Brazilian coffee in this market as Rio and Santos, and look upon it as an inferior grade. As Rio is the center of the world's coffee supply, I propose to begin from that point; and without giving any description of Rio city or even of the coffee interests there (as it is simply a port of shipment), I purpose to travel from Rio inland to the coffee districts. The great Dom Pedro Railroad, on which are used American cars and locomotives, carries us 310 miles through a section where we see remains only of coffee orchards. A twelve-hour run brings us to Sao Paulo city, the capital of a province or state of like name. Sao Paulo lies upon a great plain with low hills upon the entire horizon. It has a population of more than 250,000 inhabitants, and owes its very existence to the coffee trade, of which it is the center. It is a modern city with wide streets and comfortable houses. It has electric light and trolley cars built in the United States. It is here that the Fazendeiro (plantation owner) lives in the finest of mansions during the winter months. We must travel still further, however, to reach the coffee-growing country. From Sao Paulo many railroads diverge, all practically existing from the coffee-carrying trade.

I left from here over the Paulista road, and my first stopping place was Campinas, a distance of 80 miles, where are seen many large Fazendas (coffee orchards), but not until we travel still further do we see the world's famous ones; so I traveled on by rail to Buenopolis, some 400 miles, in which locality we find the largest Fazendas on the globe, some having about 5,000,000 trees. At Buenopolis I was most royally entertained by the owner of the largest Fazenda hereabout, and after whom the place is named, and here we see naught but straight rows of coffee trees covering the hillsides. We find ourselves on a tableland some 200 feet above the level of the sea, the surface of which presents an undulating appearance. The Fazendeiro lives with his family in a mansion usually more or less in the center of his Fazenda, and on elevated ground, and he therefore has an unobstructed view all around quite to the horizon of coffee trees. These houses are usually surrounded by splendid fruit orchards and flower gardens; in the latter I saw growing side by side pineapples, watermelons, strawberries, orange trees, bananas, and in fact all tropical fruits of South America, as well as many of the temperate zone. These houses are of enormous size, the rooms being very large and often twenty-five feet in height. Such a Fazenda is a world in itself; here are buildings for the different superintendents, a hospital, barns, buildings for the laborers, and, of course, those containing the machinery used in preparing the coffee for the market; surrounding these are the immense drying fields, which in some instances are half a mile in length. In order to give me every facility to study the coffee industry, I was driven by my host in a buckboard mile after mile over his Fazenda. We naturally visited first those parts where trees were being planted, and I found that here coffee trees bear about the fifth year after planting.

It is an evergreen, and generally grows from a single shaft, although in Brazil it is more often seen growing in bunches of six to eight slender trunks. It has a long, smooth and shining dark-green leaf with fragrant white flowers growing in clusters in the axils of the branches. The berries are formed in clusters varying in number from three to twelve, and have either very short stems or none at all. The fruit, when ripe, resembles a medium-sized ripe cranberry in size, shape, and color. Each berry contains two seeds embedded in a yellowish sweetish pulp, and which is delicious to eat when ripe.

Each seed is shaped like an irregular half sphere, so that when the two surfaces are together, they form almost a perfect sphere. The pulp is removed by a pulping process; the thin parchment skin is then taken off and the berry is polished; when this process is completed, we have the coffee of commerce. Sometimes the berry contains only one seed, the other having failed to develop. This seed is almost round, but retains the central crease common to the perfect berry, and is known as the peaberry or male berry. Much of the Mocha coffee is of this kind, and the same is found in India and Mamanguape regions of Brazil. It is also found to a greater or less extent in all kinds of coffee, just as imperfect or dwarfed cherries or apples are found on the trees with perfect fruit. This peculiar growth of coffee is screened out in the process of cleaning and sold as a separate grade. It is, in fact, what we know nowadays as Mocha coffee. In recent statistics of the coffee trade of Arabia, mention is only made of Aden as the port of shipment, and the available figures show that about a like number

of bags of coffee were imported for re-export as against the number shipped outward. Personally I have seen thousands of bags of coffee shipped from Brazil direct for Aden, the port of shipment for Mocha.

Nowadays there is no genuine Mocha coffee, that is, coffee grown in Yemen or Wady Negram. There is no coffee grown in or near Mocha. When one reads in the market reports the great number of names used to designate the different kinds of coffee he is confused, but he must remember that these names refer to the place from which the berry is shipped, and that the coffee all belongs practically to the same species. But to return to the young coffee trees. I found that holes are dug for the seed or plants as the case may be from eight to twelve feet apart. The holes are covered with bark or chips, making a sort of roof, until the plants are strong enough to stand the hot sun. During the first two years corn or beans may be planted between the rows, and the expense of cleaning is thus reduced to almost nothing by the value of these side crops, which the small farmer cultivates with his regular help hired by the year, but which the large planter loses altogether, as they belong to the men who clean and pick the coffee trees at so much a thousand. This system prevails throughout the Brazilian coffee districts, and enables the Brazilian Fazendeiro to compete most favorably with all other coffee-growing countries. Almost all labor of this nature is performed in this section by Italian immigrants.

The coffee tree measures in height when mature about thirty feet. An average coffee tree in Brazil bears something like five pounds, which, however, varies in some sections here from three to six pounds. When we consider that the average yield in other countries is only a little over one pound per tree, we can see what immense natural advantages Brazil has. The rapid decline of coffee planting in the West Indies, and the total failure in Ceylon and many other parts of the East, leave Brazil with but few strong competitors. Brazil produces more than two-thirds of all the coffee in the world, and in one year produced (during an unusually good crop) six hundred and sixty thousand tons, whereas the world consumed only six hundred thousand tons.

The vast area of inexhaustible red lands of the province of Sao Paulo alone, and immunity from the leaf disease that has destroyed the industry in Ceylon and in many parts of the West Indies, point to Brazil as the greatest coffee-producing country in the world, with which it will be very difficult to enter into competition. The range of latitude is so great that when flowers are coming out in one section the ripe fruit is being gathered in another, so that coffee is sent to market from here all the year round.

It is a singular fact that while English and German capital has been attracted to the coffee industry in Brazil, and large sums have been invested, American capital and enterprise have not seen this fine opening. Coffee planting in Brazil has been the most profitable farming in the world. Coffee can be produced at considerably below the present prices, as has been proved by some of the foreign companies, and even at a larger profit than the western American farmer realizes on his corn at thirty cents or his wheat at eighty cents per bushel.

The unexampled prosperity of the state and city of Sao Paulo is a proof of this. The growth of the coffee industry has increased the city from a college town of twenty thousand inhabitants to a cosmopolitan city of more than two hundred and fifty thousand, and has gridironed the state with railroads.

It was while at Buenopolis that I learned what the best of coffee tastes like when prepared by the coffee grower himself. In fact, in all Brazilian homes it is the custom to offer a cup of coffee to visitors, and the coffee is roasted and ground afresh each time it is served. It is not boiled as in this country, but is reduced to a fine powder and packed in a conical woolen bag; hot water is then poured through twice, and it is a percolation instead of a decoction that is served as a delicious cup of coffee. The Brazilian drinks a black cup (demitasse) of coffee about every hour during the day; in fact, it is brought to his room and his guest's at six o'clock in the morning. He claims that it is a beverage valuable for its stimulating influence upon the system, and produces a buoyancy of feeling with no unpleasant reaction; lessens the sense of fatigue and sustains the body under prolonged muscular strain, and that it does not disturb digestion, but refreshes and stimulates and retards tissue waste.

The difference in taste of coffee as found in our markets is principally due to two reasons: First, the roasting to either a reddish brown or a dark brown; secondly, coffee is picked when some berries are green, others red, and still others a dark purple, the latter being the ripe fruit. Thus we have three grades from each tree; and the difference in roasting, as mentioned, and you have six grades; then take the perfect berry, which is flattened on one side, and the spherical berry, the so-called Mocha, and that gives twelve grades of coffee. The berries are picked in the manner mentioned; should the planter wait until the unripe (green) berry becomes ripe (purple), the ripe berry would have fallen to the ground. Owing to the immense scale on which the coffee industry is carried on in Brazil, machinery must be used, whereas elsewhere the work is generally performed by hand; and the picking of the berries, ripe and unripe, at one time, which is not done so much elsewhere, as the berries on a small plantation are picked separately as they ripen, there comes into the market from Brazil this cheaper or poorer grade, and which has given Santos and Rio coffee such a poor name. But our best Java and Mocha is pretty certain to have grown in Brazil, from there shipped to Aden and reshipped here.

The Brazilian coffee is shipped via Sao Paulo as a rule to Santos, although much goes to Rio. I therefore retraced my steps to Sao Paulo, and from there traveled on the English line known as the Sao Paulo Railroad to Santos. This is the famous coffee railroad; it is some forty miles in length, and runs through an uninteresting expanse of country until it reaches the coast range of mountains, called the Serra do Mar, down which runs a cable road a distance of five miles in four inclined planes. A train coming up balances that on which you descend. The height of these

mountains is about two thousand five hundred feet; perhaps the steepest incline is ten per cent. This is the old line built some thirty-five years ago; its original cost was very great, running as it does upon the steep flanks of valleys, where much stonework was required. Owing to the peculiar topography of this section of country, enormous floods of rain fall during a single brief storm. In order to draw off these dangerous inundations, frequent sluices are built beneath the roadbed and massive conduits almost continuously follow its surface. Reaching the plain below, it is but a short run to Santos. In 1900 a second road running parallel with the one just mentioned had been completed at a greater cost even than the first one; this was done to accommodate the tremendous traffic in coffee.

Santos is the second seaport of Brazil in the value and importance of its exports. It is a hot, dirty, damp, unwholesome place. In the harbor steamers can come alongside the fine docks built of stone and the coffee cars are run onto the dock direct; then splendid hydraulic cranes are used to unload the cars directly onto the steamer—better facilities for such work than I have ever seen used elsewhere.

In Puerto Rico and Cuba, coffee is raised of good quality, but in such small quantities that it does not in the least affect Brazil's output to the world. In the Hawaiian Islands coffee of exceptionally good quality is produced, and more and more is being planted. Hawaiian coffee brings the highest price of any on the Pacific coast. In the Philippines the prospects are very bright. I have seen splendid orchards there, especially in the southern islands of the archipelago, known as the Sulu or Jolo group. On the island of Jolo there are excellent trees, and they bear two years earlier after planting than in Brazil. While in the Philippines there are large tracts suitable for coffee growing, the conditions, especially as to labor, are not as favorable as in Brazil; then, too, the coffee-bearing area of Brazil is much greater than that of any other coffee-producing country.

While we may draw a very considerable amount of coffee from our own possessions in the future it does not seem probable that we can ever produce enough for our own consumption. Nevertheless, the coffee produced in the Hawaiian and Philippine Islands is of as good a quality and ranks among the best in the world. It would therefore be profitable to invest American capital in our possessions in the Pacific, as well as in Puerto Rico and in the Republic of Cuba.

ANTARCTIC EXPLORATION.

By EDWIN SWIFT BALCH.

WITHIN the past year three expeditions have started and now another expedition and also a relief ship are about to start for the Antarctic. It is evident, therefore, that there is a good deal of desire to learn new facts about the south polar regions, and some results may be looked for in the next few years. While looking to the future, however, the past should not be forgotten, and it is imperative that some American geographers should look backward, review the results already accomplished and insist that the great work done by Americans in the Antarctic receive due recognition.

To anyone who begins to investigate the Antarctic, the first question which naturally suggests itself is "What is the Antarctic?" and the inquirer will soon find that this is not an easy question to answer accurately. The Antarctic perhaps is all the space between 60 deg. south latitude and the South Pole, for the reason that Antarctic lands extend nearly to that degree of latitude, lands with the same characteristics of fauna, flora, climate, etc. Whether an irregular line would be more descriptive of the region is not yet agreed on, but there are several islands north of 60 deg. south latitude, Kerguelen and Bouvet islands and South Georgia, which might be considered as belonging to the Antarctic. Probably it would be sufficiently accurate to consider these islands as belonging to a semi-Antarctic region.

Beyond 60 deg. south latitude two great masses of land are known, the one south of South America, the other south of Australia. The first has been traced, speaking in general terms, to 70 deg. south latitude, the second to 78 deg. south latitude. Various signs point strongly to the fact that these two masses of land are really one and that they extend clear across the South Pole, forming a continent. The existence of this continent was first recognized by Lieut. Charles Wilkes, of the United States navy, in the year 1840, and his discovery places him among the foremost explorers of all ages. He called the lands he discovered and along which he coasted for over 1500 miles, "The Antarctic Continent," but the general good sense of geographers has justly changed the name for the portion he explored into "Wilkes Land."

The term "The Antarctic Continent" would undoubtedly apply to the entire mass of land near the South Pole, just as one could say "the American Continent" or "the Eurasian Continent." But, probably on account of the length of this term, there is a move toward calling the south polar continent "Antarctica." It is a natural evolution and it may, I think, be looked on already as an accepted fact. Who first used the term as a proper name is probably at present uncertain, but one of the little tracts giving an account of the voyages of Amerigo Vespucci and published at Strasburg in 1505, was called *De Ora Antarctica*, so that the term has the sanction of age.

A difficulty now arises. The center of this probable continent is not known, but the two ends are, if somewhat vaguely. How is one to distinguish which end one is speaking about? A German writer not long since evidently found himself confronted by this difficulty, for he published a paper in 1888: "The Development of Our Knowledge of the Lands in the South of South America." And anyone to-day who wanted to speak of the lands south of South America or of the lands south of Australia, would find the same difficulty, for all the names in use are to a certain extent local names. For instance, south of South America one finds the South Shetlands, the Powell Islands, Palmer Archipelago, Louis Philippe Land, Danco Land, Foyen Land, Graham Land, Alexander Land, etc. Some

geographers have tried to call this land complex Gerstz Land, but it turns out that Gerritz did not go to the Antarctic at all. English geographers, under the impression apparently that Graham Land was discovered by Biscoe in 1832, mark Graham Land in big letters on their charts, although there is no apparent record of anyone of the name of Graham among Antarctic explorers. But a neglected paper "Executive Document No. 105," of the twenty-third Congress of the United States, dated 1828, tells how Benjamin Pendleton, of Stonington, had been on a coast and explored a great bay or strait in the very spot which Biscoe reached in 1832.

A continued study of Antarctic explorations soon forces to one's notice the absolute need of special names to distinguish the two great known masses of land in the Antarctic, and it seems as if evolution solves the problem there as well as everywhere else. The whole mass is becoming known as "Antarctica;" one end is in longitude west, the other in longitude east of Greenwich, and the names "West Antarctica" and "East Antarctica" suggest themselves at once as accurate, concise and descriptive. Whether geographers will see fit to adopt these terms remains to be seen, but I would like to suggest these names as, in my opinion, answering perfectly to the necessities of the case.

The entirely unknown portion of this probable "Antarctica" is pretty big. Dr. Supan estimates it at twice the size of Europe. Antarctica probably, judging from fossil remains, was bigger in former æons, and was at various times connected with Australia, South America and Africa. Of the partially explored portions, less is known of that than of any other part of the world's surface, perhaps partly because of its distance from the centers of thought and partly because of its dreary, inhospitable, barren nature. Animal life is almost wanting in Antarctica and human life is entirely so, and not the least interesting fact connected with its history is that there seems to be no record of any woman having crossed the 60th parallel of southern latitude.

The Antarctic fauna is decidedly odd. In the main it consists of whales, seals and penguins. The habits of the seal and penguins are strikingly analogous. The seals live in the water and come onto the ice to sun themselves, while the penguins live on the ice and spend a large part of the time in the water catching shrimps. Except for the trifling difference that one is a bird without wings and the other a mammal with neither arms nor legs, there is surprisingly little dissimilarity between the two. There are no land animals in Antarctica, and this will be one of the greatest hindrances in exploring it, as the penguin appears to be almost unfit for food. Dr. Cook describes the flesh as appearing to be made up of an equal quantity of mammal, fish and fowl, and as tasting like a piece of beef, an odoriferous codfish and a canvasback duck, roasted in a pot, with blood and cod liver oil for sauce. A few insects, a few fishes and a little reindeer moss complete the list as now known of life in Antarctica.

There have been three distinct periods in the ideas of geographers about the Antarctic; the first, when it was believed that there was land at the South Pole; the second, when it was believed there was ocean; and the third or present period, when there is a growing tendency to return to the original belief.

The first period certainly goes back to some time before the Christian era. A number of writers among the ancients mention vaguely that there must be lands in the south. A Chaldaean, Seleukos, who lived on the Tigris between about B. C. 175 to B. C. 125, is perhaps the earliest savant known to have held such a belief. Aristotle, Hipparchus, Marinus of Tyre, Krates, Eratosthenes, Aratus, Strabo, Geminus, Pomponius Mela, Macrobius and Manilius also guessed at southern lands. The idea comes down through the Middle Ages with Baeda Venerabilis, Rhabanus Maurus, Guillaume de Conches, Albertus Magnus, Roger Bacon and one or two Arab geographers. Several old maps show some of their ideas, one of which was that Africa, south of Zanzibar, extended eastward to beyond the Malay peninsula, where it rejoined the Asiatic coast, forming a closed-in Indian Ocean. All these early ideas, however, are mere guesses.

In the year 1502 comes what must be looked on, probably, as the first discovery of a semi-Antarctic land. On his third voyage, Amerigo Vespucci sailed southeast from the South American coast, and reached a land in 52 deg. south latitude. The probability seems to be that this was South Georgia, but it must be said that Humboldt thought it was the coast of Patagonia. During the sixteenth, and also the seventeenth century, on many old maps a great "Terra Australia Incognita" is represented as stretching completely across the South Pole. On some maps, however, the region is represented as an ocean. Sometimes Tierra del Fuego is represented as a part of the Terra Australis and sometimes it is not. The great Terra Australis on many of these maps extends north almost to Java even before 1550, and it is impossible not to have the conviction forced upon one that Australia must have been sighted before that date, although there do not appear to be any records of the discovery. It may be incidentally remarked that on some of these maps before the year 1600, Alaska is marked quite accurately in shape and position, as is also Bering Strait, although Bering did not come round there till another century had slipped by. The whole "Terra Australis," however, was at best a very vague idea.

A. de Herrera's book about the West Indies was published in 1601 and it was republished in three languages in 1622. In this later edition a passage was added, saying that in the year 1599 a Dutchman, Dirck Gerritz, had discovered land south of Cape Horn in 64 deg. south latitude. This has been accepted as correct until about four or five years ago, when two documents were discovered in the Dutch archives, one of which says that Gerritz went only to 56 deg. south latitude, and the other that one of his men, Laurens Claess, of Antwerp, went to 64 deg. in 1603 with a Don Gabriel de Castiglio, only Claess does not say anything of land. The matter is not yet cleared up, but the fact remains that West Antarctica does lie south of Cape Horn, that it extends across 64 deg. and

that this fact was published in 1622. It seems as if somebody must have seen land, although at present it does not seem possible to say who.

Through the next century the great "Terra Australis" kept bobbing about on various maps, some minor discoveries were made, and several captains crossed the 60th parallel. LaRoche, Sharp, Cowley, Davis, Rogers, La Barbinais, Shelvocke, Roggeveen, may be mentioned among them.

In 1738-39 comes the first genuine attempt at Antarctic exploration, the honor of which belongs to France. Des Loziers Bouvet, a French naval officer, sailed south of the Cape of Good Hope for a long distance along the edge of the Antarctic ice, and while so doing he discovered Bouvet Island, which is in 54 deg. 26 min. south. His discovery was doubted, of course, and some people said he had only seen clouds. After him came Ducloz Guyot, Marion du Fresne and then Kerguelen, who discovered in 1772 Kerguelen Island. He also was violently abused, and some people said he also had seen only clouds. In 1772-75 Captain James Cook made the first circumnavigation of the Antarctic. He went repeatedly beyond 60 deg., several times beyond the Antarctic Circle, and on one occasion reached 71 deg. 10 min. south. He did not sight any portion of the southern continent, and his trip did away completely with the belief that land extended anywhere north of 60 deg. He closes the first period of Antarctic discovery, the belief now becoming general that the Antarctic was ocean and not land.

The second period opens with the voyages of numerous sealers and closes with the voyage of Wilkes, which restored the idea of the existence of a southern continent. The early explorations were in West Antarctica, and they were pretty much all made in the way of business, that is, they were made by sealers engaged in what they called the "skinning business." In two or three cases, however, the travelers were officers of the English navy. Among these men may be mentioned Swain, Macy, Lindsay, Smith, Edmund Fanning, William A. Fanning, Sheffield, Bransfield, Palmer, Pendleton, Powell, Morrell, Johnson, Weddell, Foster, Biscoe, Rea, Binstead, Kemp. Smith was the first apparently to sight the South Shetlands in 1819. Edward Bransfield in 1820 probably made, on one of the Shetlands, the first landing in West Antarctica, at which time he made the first discovery of Antarctic vegetation. The most prominent of these men, however, was Nathaniel B. Palmer, of Stonington, Conn. As far as the records show, Palmer probably discovered and certainly first sailed along the northern coast of what present indications would point out as being the mainland of West Antarctica. His name was given to that land by a Russian explorer, Bellingshausen, who met Palmer at the South Shetlands in 1821, after Bellingshausen had just completed the second circumnavigation of the Antarctic, during which journey he discovered Alexander Land.

An English explorer, Biscoe, made the third circumnavigation of the Antarctic in 1831-32. He discovered Enderby Land in East Antarctica, and afterward reached the land in West Antarctica which, after that time, was called Graham Land, and which English geographers ever since have claimed as Biscoe's discovery. The executive document previously mentioned, however, which is dated 1828, is good proof that this land was reached several years before by Benjamin Pendleton, of Stonington.

In 1839 an English sealer, John Balleny, discovered the Balleny Islands, and also had a glimpse of the mainland of East Antarctica. All his journal says is: "Saw land to the southward," and "the ice was quite fast, with every appearance of land at the back of it." But he never suggested nor even suspected that he had seen anything but another island.

In the months of January and February, 1840, two expeditions reached the mainland of East Antarctica. One of these, the French expedition under Dumont d'Urville, sighted at one spot a great piece of land on January 19, which was called Adélie Land, and at another spot a row of ice cliffs, which was called Côte Clarie.

The other expedition was the United States Exploring Expedition under the command of Charles Wilkes. They saw an appearance of land on January 13, which was certainly the Balleny Islands, then on the 16th they sighted land more surely, "Ringgold Knoll," in 157 deg. 46 min. east longitude, and on the 19th they sighted quite positively Cape Hudson. Wilkes then followed the coast westward until the middle of February for over 60 deg. of longitude. His journey was accomplished in constant danger, amid fogs and storms and huge tabular icebergs, and it is one of the most brilliant exploits of the American navy. One of his ships was nearly crushed by bergs. His own ship, however, and that of Commander Ringgold, carried out their explorations and proved that there was a South Polar Continent.

On his return to Sydney, Lieut. Wilkes immediately announced the discovery of "the Antarctic Continent" to the Secretary of the Navy in the following letter, dated at Sydney, New South Wales, March 11, 1840:

"It affords me much gratification to report that we have discovered a large body of land within the Antarctic Circle, which I have named the Antarctic Continent, and refer you to the report of our cruise and accompanying charts, inclosed herewith, for full information relative thereto."

Two days later the first account of the discovery of a South Polar Continent ever printed was published in the Sydney Herald of March 13, 1840. This land is now called on most maps "Wilkes Land." It is scarcely probable that the charted outline of the coast of Wilkes Land is accurate, sketched in as it was during a single reconnaissance; but that there is the shore of a continent between about 154 deg. and 100 deg. east longitude, can scarcely be doubted by any one who reads Wilkes' "Narrative." The vast number of ice islands and tabular icebergs shows that there is some extensive nucleus which retains them in an interrupted line on nearly the same degree of latitude, and, moreover, these enormous bergs are not formed, according to most explorers, in the open sea. Along this extended coast neither any open strait nor any northerly currents were observed, and the absence of both are strong proof of a continental mass of land, rather than of an archipelago of islands.

It seems as if this discovery closed the second period of Antarctic discovery, which was the exact opposite of the first period in that the second period began with the belief in an Antarctic Ocean and terminated with the announcement of the existence of the new continent, Antarctica.

The third period extends from the year 1840 to the present day. All the discoveries made in this period tend more and more to show the existence of the continent of Antarctica. The names of the principal explorers of the third period are Ross, Crozier, Smiley, Moore, Heard, Dallmann, Nares, Larsen, Evensen, Kristensen, de Gerlache, Chun, Borchgrevink.

Two of these travelers are of special importance. The first is Ross, who, in the year 1841, discovered a coast, which he called Victoria Land, and which is evidently the continuation to the east and the south of the coast of Wilkes Land. He also followed a great ice barrier for over four hundred miles, reaching 78 deg. 4 min. south latitude. On his return north he passed four or five degrees east of Wilkes Land, which he never approached. Nevertheless, on the strength of the fact that Wilkes had sent Ross a chart before Ross started on which the Balleny Isles were marked, only some fifty miles too far to the north, and because Ross sailed over this spot, Ross did not put Wilkes Land on his map. To all the written statements of Wilkes about this in his various papers and to all the maps published by Wilkes, Ross paid no attention whatever, although Ross quotes from several of Wilkes' publications. I regret to say that some geographers still accept Ross' asseverations and omissions as accurate, and, apparently without any examination of the facts, leave Wilkes' discoveries off their charts. I want to protest against such methods in geography, and I hope some American and some continental geographers are going to take up this matter and compare the original documents, that is, the writings and the charts of Wilkes and Ross. The truth in science to-day is bound to be known.

The other expedition of the present period of especial importance is that of de Gerlache in the "Belgica," three years ago. The explorers first sailed through Gerlache Strait, then along the west coast of West Antarctica past Alexander Land; and then they wintered in the pack, drifting farther west, in about 70 deg. south latitude. The soundings made through the ice showed that they were over the shelf of a plateau, which rose toward the south, while toward the north it fell abruptly, going to show that they were on the edge of a continental plateau. Still more important were the meteorological observations. The mean temperature of the year was -9.6 deg. C., an extraordinarily low figure for that latitude. This low temperature can only be explained by the absence of land toward the north, and the presence of an Antarctic continent entirely covered with ice to the south. The hypothesis is based upon a fact which was observed by the expedition. Every time the wind blew from the north the temperature rose, even in mid-winter, to 0 deg. C., but did not ascend higher. As soon as the wind shifted and blew from the south, the thermometer descended abruptly, even in the middle of summer, to a low temperature.

In closing this brief account of Antarctic explorations, I wish to express the hope that some attention may now be given to the subject by American geographers, in order that men like Palmer and Pendleton may have justice done them, and especially to bring out the fact that the discovery of the continent of Antarctica is an American discovery, and a discovery which places Charles Wilkes at the head of American explorers.

WATER IN AUSTRALIA.

EVERYBODY knows that Australia is one of the greatest growers of domestic animals. At the beginning of 1900 there were 1,639,127 horses, 9,678,422 cattle and 72,624,735 sheep. A large number of these animals live in the semi-arid regions, where the water supplies are inadequate unless reinforced by artificial means. Both the government and private enterprise have for years been giving much attention to increasing the water supply, with the result that they have augmented the ability of Australia to raise live stock so far that millions of animals are now growing where grazing was formerly impossible.

According to the New York Sun, at the end of 1900 the government of New South Wales had completed the sinking of eighty-two wells, fifty-six of which brought water to the surface, while it was necessary to use pumps in eighteen and the remaining wells proved failures. The daily water supply provided by these wells is 32,700,000 gallons. The deepest well is the Dolgelly, on the nearly rainless grazing lands in the northern part of the State, west of the mountains. This well is 4467 feet deep and supplies 745,000 gallons of water daily.

The Kenmare bore, several hundred miles further out on the plains, is not nearly so deep, for it is only 1682 feet in depth, but it provides a far greater quantity of water, the daily supply being 2,050,000 gallons. Another noteworthy well on the northern plains of New South Wales is that at Para, which is 1262 feet deep and supplies 300,000 gallons a day. The experiment has been made here of raising crops by irrigation on the grass lands. About fifty-six acres are under plow and irrigation and fruits and vegetables are being raised with great success. Similar experiments have been made near the artesian wells at Native Dog, Barrington, Cungonia, where luzerne, maize, tobacco, wheat, sugar cane, pineapples, dates and other fruits are grown in great quantity and of excellent quality. This proves that the vast plains of Australia, now devoted almost wholly to stock raising, have every requisite for successful farming except adequate supplies of water.

Seven artesian wells have been dug on the formerly waterless route from Wanaaring to Milparinka. They supply 2,300,000 gallons daily. Other borings further north also give good results.

Besides these government borings many private individuals have dug wells in New South Wales which give a daily supply of 45,000,000 gallons.

The statistics of Queensland up to July, 1899, show