

pounds in weight, was taken in a beach seine haul in the small lagoon on the northwest corner of Carmen Island. Mr. Cecil Branson of Carmen reported that they also frequented a cove on the south side of the island. Some smaller sand squeteague (*Cynoscion arenarius*)* were caught in the nets of the shrimp boats, as well as small croakers (*Micropogon*) of various species some of which were also caught in the beach seine. A few king whiting (*Menticirrhus americanus*)* weighing less than two pounds were also taken by the shrimp boats.

* Tentative identification

Early Explorations in the Gulf of Mexico

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History of early explorations in the Gulf of Mexico has a particular appeal to the persons engaged in the present studies of the oceanography and biology of this body of water. Thrilling descriptions of the adventures of the earlier explorers not only contain the records of their accomplishments and frequent failures but provide also an understanding of the personalities of the principal actors of the New World drama. From the yellowish and musty pages of the old books and maps arise live human beings who, poorly equipped but with great courage and determination, went to explore the unknown lands beyond the vast expanse of the western ocean. Their characters and the motives behind their heroic actions become understandable; and one is tempted to compare their lives and the conditions under which they labored with the present situations of scientists engaged in a study of problems of grave national importance.

Political and economic rivalry among the countries of western Europe during the sixteenth and seventeenth centuries was so acute that their successful penetration into the wilderness of the New World, establishment of colonies, and access to gold, silver, and other riches of the new continent had profound effects on their destinies.

The beginning of the explorations in which the adventurers of Spain, Portugal, France, and England competed and frequently fought with each other for the possession of new territories can be formally dated back to the first voyage of Columbus.

The existence of the large sea called, at present, the Gulf of Mexico was known, however, to the natives long before the white man set foot on the newly discovered land. Aztecs of Mexico and natives of Yucatan were able to sail considerable distances from the mainland. Some of them mastered the art of map making to a fairly high degree of perfection. It is known, for instance, that in 1520 Montezuma presented Cortez with a map painted on a henequin cloth in which were marked rivers and bays of the northern coast of the Gulf from Panuco to Tobasco, a distance of about 140 leagues. In July 1502, sailing south from Cuba toward Honduras parallel to the eastern coast of Yucatan, Columbus encountered an Indian vessel of the size of a Spanish galley with 25 men in her crew. The ship, laden with various goods and products, was sighted 150 nautical miles from the coast of Cuba and about 79 miles off the Yucatan coast. Had Columbus followed the Indian ship he would soon have discovered the Yucatan and found the route to

Mexico. He sailed south and east, however, believing that this course would lead him to Cathay, the name by which China was known to medieval Europe.

The first discoverer of the Gulf of Mexico cannot be positively named, since the records of the early European explorations in the Gulf are confusing and frequently contradictory. The year of the European explorations in the Gulf naturally begins with the voyages of Columbus. In June 1494, during his second voyage, Columbus followed the southern shores of Cuba as far as Isla de Pinos and, disregarding the information received from the Indians that the end of the island was not far, he decided that Cuba was not an island but a part of a continent and sailed eastward. In this way, his opportunity of discovering the Gulf was lost.

First claim for sailing along the southern and eastern coasts of the new continent for a distance of 870 leagues (probably as far north as Cape Hatteras) was made by the man whose name is forever associated with America. Amerigo Vespucci, the third son of a Florentine notary was born March 9, 1451. He studied diligently and became quite proficient in astronomy and in the use of astrolabe, but his principal interest was in a commercial career. He established himself as an agent for the House of Cadiz, and in 1495, after the death of Juanito Berardi who contracted to supply 12 vessels of 900 tons each to the crown of Spain, Vespucci undertook to settle the claims left after his friend's death and to complete the equipment of ships. In 1497, at the request of the king, he joined the expedition to the New World. As he says in his own words, "the king, Don Fernando of Castile, being about to dispatch four ships to discover new lands toward the west, I was chosen to aid in making discovery" (Thacher, 1896, p. 69). He never explained his exact duties aboard the ship, but judging by his previous experience and excellent acquaintance with commercial methods he probably went as a sort of supercargo to supervise the distribution of food, to weigh the gold, and to keep accurate tally of the crown's share which, according to the royal decree of 1495, was one-third of the total gold obtained by the expeditions. A rather informal description of the first voyage of Vespucci is contained in his letters written in Italian to his friend. The text was later translated and published in Latin.

The expedition sailed on May 10, 1497, from Cadiz and made a landfall, probably off the coast of Honduras in the vicinity of Caba Gracios a Dios. From this point it sailed along the coast, and after a bloody encounter with the natives in the Campeche region the ships reached the province of Lariab. In the Latin translation the place is called Parias, a mistake which caused great confusion and dispute since it led many to believe that Vespucci referred to the Gulf of Paria off the Venezuela coast discovered by Columbus in 1498 during his third voyage. The informal style of Vespucci's narrative and obscure meaning of several of his statements induced many to believe that his claims were false and that he never even had participated in the voyages he had described (Humboldt, 1837). Others, however, gave him full credit for his achievements. His letters sounded sufficiently convincing to the group of cartographers who worked in the small village of Saint-Die in Lorraine. In about 1507, in recognition of his achievements, they decided to give the name "America" to the continent of the New World (see Martin Waldseemüller map of 1520 and Leonardo de Vinci map of 1512). The controversy about the role of Amerigo Vespucci in geographical discoveries in the New World continued for centuries. Some of his critics of more recent years maintain that Spaniards had never discovered the Gulf which very

likely was visited first by the Portuguese captains who landed on its coast shortly before the year 1500. The true role of Amerigo Vespucci in the discovery of the New World probably never will be determined with certainty. It is significant, however, that the so-called Cantino map, executed in Lisbon between December 1501 and October 1502 contained the data which were described by Vespucci in his letters. This chart shows Cuba as an island, and the northwestern continental land is plainly shown from the southern point of Florida to the Hudson River. Likewise, Vespucci's discoveries are clearly depicted by Waldseemüller in a map of 1507 printed in Ptolemy Geography in 1513. As Thacher (1896) states, "Surely some ship sailed to the south of Cuba into the Gulf of Mexico around the point of Florida and well up the northeast coast before the beginning of the sixteenth century. No one ever claimed to have done these things except Amerigo Vespucci."

Tales of fabulous riches in the new land, of gold and precious stones, told by the crews of the earliest explorers upon their return to Spain stimulated feverish activities. During the first quarter of the sixteenth century large numbers of expeditions were outfitted and sailed westward. Science played only a minor part in these undertakings. The governments sponsoring the expeditions were interested primarily in the conquest of new territories, in establishing new colonies, and increasing their revenues by imposing high taxes on gold, silver, and precious stones brought back from the New World. Explorers and adventurers successful in obtaining royal decrees authorizing their enterprise were looking for a quick personal enrichment and glorification. It was customary that each expedition be accompanied by an astronomer cosmographer or cartographer to help in navigation and to record the observations needed for the preparation of maps. The duties of these men were not clearly defined, their work was frequently ridiculed and they suffered from the lack of understanding and even open contempt of the crews.

It is impossible in a brief review, to summarize the results of the principal expeditions which visited the Gulf of Mexico during the first half of the sixteenth century. For the purpose of this paper, it is sufficient to mention that in 1513, Ponce de Leon, after making a formal discovery of Florida, found the Florida Keys which he called Las Islas de los Martires and the Tortugas Islands.

In 1516, Diego Miruelo undertook another expedition to Florida, while Fernando de Cordova and Antonio de Alaminos explored the northern and western coasts of Yucatan and reached Campeche Bay. In 1518, Juan de Grijalva, in command of a force consisting of 4 ships and 250 men, retraced Cordova's route toward Yucatan, discovered Cozumel Island which he named Isla de Santa Cruz, and explored the western coast of the Gulf as far as Panuco. During this expedition the Spaniards for the first time heard the name Mexico applied to this part of the new continent. In 1519, Hernando Cortes, with Antonio de Alaminos as chief pilot, explored the same coast again and established the town of Vera Cruz while Alonzo Alvarez Pineda explored the northern coast of the Gulf and discovered the mouth of the Mississippi River which he called Rio del Espiritu Santo. Ill-fated expeditions of Panfilio de Narvaez in 1527 and of his successor, Cabeza de Vaca, explored the west coast of Florida, including Tampa Bay and the northern coast of the Gulf from Apalache Bay, and Apalachicola River (which the Spaniards called Rio de Magdalena) to the Mississippi River. The largest adventure of this type was the expedition of De Soto who assembled 7 ships with about 700 soldiers and in 1538 sailed from Havana to Florida. The dis-

covery of Pensacola Bay, the convincing evidence that the Mississippi is a mighty stream which drains from a large continent, and the exploration of the northern coast of the Gulf, from Florida to Mexico, were the principal scientific results of De Soto's expedition. The conquest of Mexico by Cortes and the completion of the De Soto explorations marked the end of the period of earliest discoveries in the Gulf.

The Spanish government and the educated portion of the Spanish nation realized the great advantages derived from the possession of the newly acquired territories. Ability and resources to develop them were insufficient, however, but Spain jealously watched the efforts of other powers to establish colonies in America. Maps, astronomical observations, sailing directions, and other scientific products of explorations were carefully guarded. Using the modern expression, it can be said that all scientific data of earlier explorations were "classified." It was forbidden to disclose them to foreign powers. Cartographers and navigators of that time often found themselves in a difficult situation when in possession of material sought by an unfriendly power.

Realizing the importance of new geographical discoveries, the Spanish government formed in January 20, 1503, an office called Casa de la Contratacion de las Indias which functioned as a peculiar combination of the board of trade and a hydrographic office, established with special reference to regulate the commerce and navigation in the New World. The Casa had a separate department of geography and cosmography which was established in 1508 to exercise control over the charting of the newly discovered territories. For this purpose, the government ordered the preparation of a master chart, *Padron Real*, the completion of which was entrusted to such famous navigators as Amerigo Vespucci, Juan Diaz de Solis, and Vincente Pinzon. Official marine charts were considered of such great importance that they were kept secret, under lock in the coffer with two keys, one for Pilot-Major and one for Cosmographer-Major of the Casa. At the same time, the Spanish government issued an order prohibiting foreigners to hold the rank of pilot or mate on any Spanish ships. These attempts to prevent the dissemination of geographical knowledge confronted the astronomers and cartographers with a predicament familiar, at the present time, to scientists engaged in classified research. By the order of the government, all pilots were enjoined to trace on their charts "every land, island, bay, harbor, and other things new and worthy of being noted," and to turn over the charts to the Pilot-Major as soon as their ships landed in Spain. They could use only official copies of the government charts verified by the officials of the Casa. In this way rigid governmental control was exercised over the publication and sale of charts.

Data turned in by the pilots were not too accurate, the errors being particularly great in the determination of the longitude. As a matter of fact, scientific cartography became possible only in the middle of the seventeenth century when in 1657, Huygens built the first reliable pendulum clock, and this time-keeping instrument together with the telescope were adopted for astronomical observations. The determination of longitude was the weakest part of sixteenth century navigation. Navigational instruments of that time were few and simple. They consisted of an astrolabe, astronomical ring, and cross staff or back staff, the latter being crude forerunners of the modern sextant. The latitude was determined with fairly good accuracy, the error being about 1 degree, but for the determination of longitude the pilot was dependent on dead reckoning made with the traverse board on which the ship's daily speed and course was set. The crude methods sometimes led to fantastic errors and caused many

arguments between the principal maritime powers. The situation became the source of grave disputes when Pope Alexander VI, issued, in 1493, the Bull of Demarcation. The purpose of this masterpiece of diplomacy was to settle claims of the two rivals, Spain and Portugal, by assigning to the first one "all lands not already belonging to any other Christian prince which had been or would be discovered 100 leagues west of the meridian line passing through the Azores," and to Portugal all the discoveries east of this line. The catch was that nobody knew the position of the line.

During the fifteenth and sixteenth centuries, the trade in maps and charts developed as a highly specialized profession. The cartographer was a learned man—proficient in astronomy and navigation and a skillful draftsman. He was also an artist, experienced engraver, and printer. Information needed for the construction of a new map was coming to him from various sources—frequently smuggled from abroad or obtained by other illicit means. His fate was not always a happy one, especially if he permitted himself to get mixed with politics or involved in a controversy about religious dogmas. Mercator, whose name is forever associated with navigational charts and map projection, was one of the foremost cartographers of the sixteenth century who, during the 57 years of map making, perhaps did more than any other man to elevate cartography from a low art to the position of exact science. One of his maps made in 1538 for the first time applied the name "America" to both the North and South American continents. In 1544, he hardly escaped from being burned at the stake when, by the order of the Regent Mary, Queen Dowager of Hungary, he was seized as an heretic, and with 43 others condemned to death. The campaign against Lutheran heresies at that time was conducted with such violence that the only restraint against wholesale slaughter was the consideration that the provinces should not be entirely depopulated. Men of science had to watch their words and actions very carefully in order to avoid the clutches of the inquisition. The conditions under which they worked remind us of the present situation of thousands of scientists laboring behind the Iron Curtain and forced, under the continuous threat to their lives, to conform their findings to the principle of Marxian doctrine as interpreted by the politbureau in Kremlin.

The position of a cosmographer or astronomer attached to various expeditions was a peculiar one. The undertakings were of a definitely military nature. Large forces, sometimes comprising several hundred foot soldiers and horsemen, were assembled. Ships were loaded with weapons, food, various supplies, and sundry materials for establishing colonies. Large dogs, mostly greyhounds and mastiffs, trained for battle, were taken in large numbers and used in fighting the Indians and guarding camps. In the conquest of the New World, these dogs accomplished great feats and won the admiration of Spaniards, who recorded in their annals the names of the most celebrated animals. The greatest strength of the invaders consisted, however, in horses. The sight of an unknown, large animal, protected by heavy leather covering which extended down to its knees and mounted by heavily armed horsemen, was terrifying to the Indians until they learned the technique of incapacitating the horses by shooting arrows into their knees. The effect of cavalry attacks on Indians during these expeditions was probably similar to the effects of first attacks of tanks on the army entirely unprepared to oppose the new weapon. From the commentaries of Cabeza de Vaca or from the history of the De Soto expedition written by Garcilaso de la Vega so-called "The Inca" we learn about the efforts of the men who while participating in the military

operations at the same time were engaged in astronomical observations, surveyed the coast, and recorded the nature of the country, listed its plants and animals, determined its suitability for colonization, and described the customs of its natives. Frequently these duties were combined with the functions of a government representative assigned to the expedition. Thus, the De Soto expedition was accompanied by Juan de Añasco who as a comptroller of His Majesty Imperial Exchequer was looking after the interests of the Spanish treasury. According to Gracilaso, he was also a "cavalier," a great mariner, cosmographer, and astrologer." He brought back documented reports regarding the coastline, harbors, anchorages, and observations on mineral riches, and fertility of the country. How little support this man received from his companions may be judged from an incident described by Gracilaso. Toward the end of the De Soto expedition, after the death of its leader and the loss in fire at Mobile of all the instruments for navigation, the survivors managed to build several small canoes in which they escaped from the pursuing Indians. After leaving the mouth of the Mississippi River, they sailed westward, traveling near the coast. Añasco, being a resourceful man, managed to salvage an astrolabe which because it was made from metal was only slightly damaged by fire. From a parchment of deerskin he made a sea chart, and with a ruler, he constructed a forestaff. These crude instruments were of great help in guiding the boats, but his companions ridiculed him so for his efforts that in disgust he threw all the instruments overboard.

Sometimes the expeditions were accompanied by artists who made pictorial records of the country and its people. Probably the most interesting documents of that type were made by LeMoynes in 1564, an artist who accompanied the French expedition to Florida under Laudonniere. Fortunately, the original drawings depicting the life of Florida Indians, excellently reproduced in 42 heliotypes published in 1825, are now available for study together with the translation from the original Latin text.

Records of the earliest explorations of the Gulf open up an interesting picture of a slow and uncertain progress of scientific research conducted under the most difficult conditions by men of great determination and unflinching energy. Bits of scientific knowledge gained during these efforts, scattered and unsystematized as they were during the first half of the sixteenth century, eventually were brought together and correctly evaluated. They helped to form a sound basis of the present geography of the Gulf. The cosmographers and explorers of that time often found themselves in the possession of information which was of great importance to the government and the disclosure of which to a foreign power would be regarded as treason. As at the present time, the attempts to keep scientific data confined to state boundaries completely failed proving that they cannot be kept secret indefinitely. In studying the records of the earliest explorations, one cannot fail to have high respect and admiration for the explorers and scientists of the old time whose determination and resourcefulness laid the foundation of our present geographic knowledge.