

## CHARLES LYELL IN LOUISIANA

HUBERT C. SKINNER  
TULANE UNIVERSITY

In 1845-1846, Charles Lyell, renowned British geologist and author of the *Principles of Geology* (London, 1830-1833, et seq. ed.), made a second visit to the United States of America, a geological excursion during which he came to Louisiana to view and study the Mississippi River and its delta. The intent here is to review Lyell's observations on the lower Mississippi River and other geological features in Louisiana and briefly to evaluate his influence on subsequent studies. He was the first qualified earth scientist to visit and comment on the Louisiana area.

Charles Lyell and his wife reached the City of New Orleans on the 24th of February 1846, during his second visit to the United States.<sup>1</sup> He had travelled the distance of 175 miles by coastwise steamer through the "inland passage", a natural channel positioned between the mainland and a series of offshore bars which lie a few miles off the coast and serve to shield the states adjoining the northeastern Gulf of Mexico from the turbulence of the open Gulf waters. The route then led through a deep, narrow inlet or pass into Lake Pontchartrain and along its southern shore to a landing six miles north of the city. At this point, the Lyells disembarked and continued their journey by rail, for the short remaining distance into New Orleans.

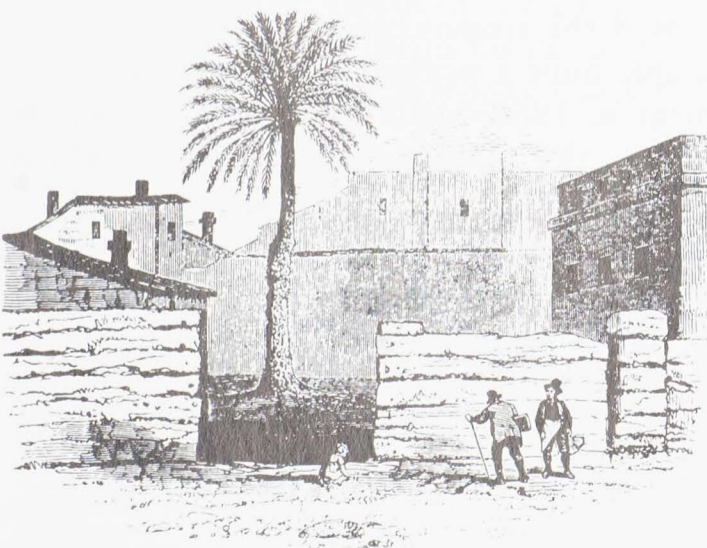
By the time Mr. Lyell reached New Orleans, his reputation as a geologist was established firmly. He was quite well known to local scientists, and to many others among the citizenry. In the pages of the *Daily Picayune*,<sup>2</sup> he was referred to as "Mr. Lyell, the celebrated geologist." Among those he met with at New Orleans, were two of the most distinguished men of science in Louisiana, William Marbery Carpenter, first Dean of the Louisiana School of Medicine, and John Leonard Riddell, inventor of the stereoscopic microscope and professor of chemistry at the University of Louisiana.

Dr. Carpenter, a medical doctor who had an excellent knowledge of and consuming amateur interest in botany and geology, accompanied Mr. Lyell on an excursion down the Mississippi River to its mouths and on another to Lake Pontchartrain, travelling along the *Gnathodon*<sup>3</sup> shell road and returning by boat on Bayou St. John's which still extends today from the lakefront to the old city limits. Also, Dr. Carpenter had published in 1838 an account<sup>4</sup> on Bartram's "fossil forest" at Port Hudson (located on the Mississippi River above Baton Rouge), and he was anxious for his famous visitor to examine this section and to render his geological opinion on the locality. Mr. Lyell later did so, though his view of the cliffs was obstructed seriously by high water.

Dr. Riddell, professor of chemistry at what is now Tulane University, and a most remarkable man, was possessed of many talents and varied interests. He is remembered as a physician who contributed research papers on the yellow fever epidemics, as a botanist interested in the floras of the southern states, and as a geological observer who calculated through experiments the proportion of sediment contained in the waters transported by the Mississippi River, as well as a teacher and a chemist. In 1851, he invented the stereoscopic or binocular microscope, built a working model of this instrument in 1852, and displayed his innovation before the American Association for the Advancement of Science in July 1853.<sup>5</sup> Also, Dr. Riddell was appointed melter and refiner at the New Orleans Mint, and, in August 1860, was appointed postmaster of New Orleans by President Buchanan. He was a man of many facets. Charles Lyell utilized the observations communicated to him by Carpenter and Riddell, and Riddell's experimentally derived figures on the amounts of sediments contained in Mississippi River waters as a basis for his estimates of the antiquity of the lower delta of this great river.

One of Charles Lyell's most significant observations was made as he entered Louisiana before he reached New Orleans, as follows: "We had already entered the large lagoon, called Lake Pontchartrain."<sup>6</sup> In this short, perceptive, and brilliantly-turned phrase, he both labelled the lake correctly and explained its origin. It is, in fact, a shallow land-locked bay or lagoon isolated from the remainder of Mississippi sound by the prograding delta building seaward across an offshore bar. Even today, the origin of Lake Pontchartrain is misunderstood and disputed by many observers who should not have this difficulty. This writer has encountered this problem repeatedly in his own work on the geology of southern Louisiana. For example Lake Pontchartrain has been termed the "world's largest estuary" simply because of the estuarine conditions which are present in the ecosystem of the delta region. Environmentalists and others working on this area today would profit from some measure of the clear insight and understanding demonstrated by Sir Charles in his initial observations.

While in New Orleans, Mr. Lyell inspected some "mammoth fossils" which had been brought into the city from Texas. These bones were to be shipped to England.<sup>7</sup> He found among them fragments of the bones of six different extinct species of fossil quadrupeds. On April 27, he wrote to Leonard Horner from Philadelphia about this, stating: "Tell Dr. Falconer to look out

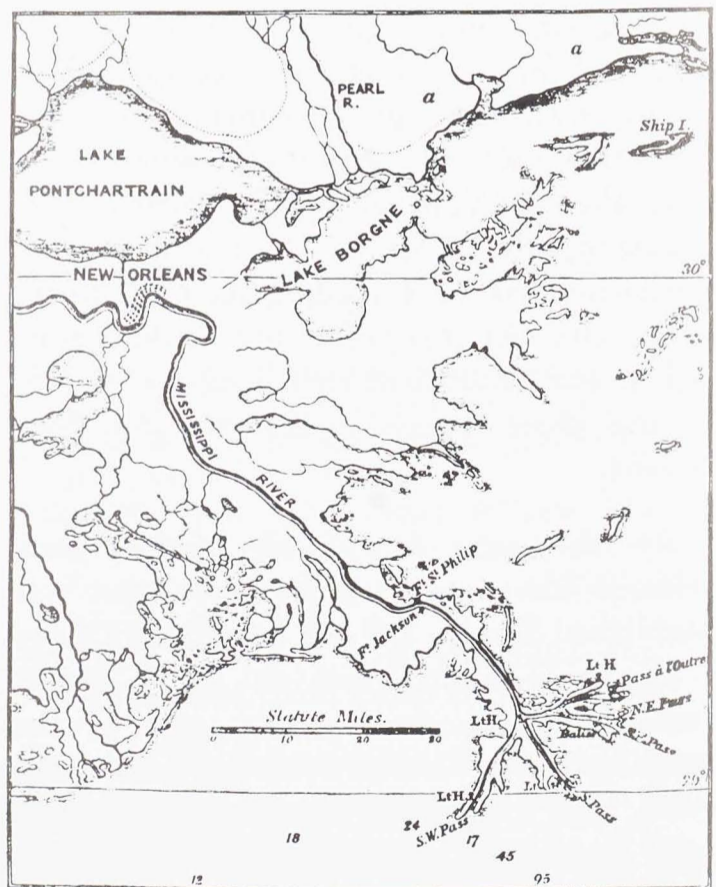


*Père Antoine's Date-palm (Phoenix dactylifera).*

Figure 1 (from Lyell, 1850, v. II, p. 138)

for some splendid teeth of Texas elephants which are going from New Orleans to London for sale."<sup>8</sup> During his brief stay, Charles Lyell sketched the "fine date-palm, thirty feet high, growing in the open air"<sup>9</sup> planted some seventy or eighty years earlier by Père Antoine, a Roman Catholic priest, about whom several romantic tales have been recounted (see Figure 1). Lyell's notice and comments about the venerable date-palm and its cultivator are doubtless responsible for the survival of at least one of the Père Antoine legends. He has been widely quoted by New Orleans writers in the present century<sup>10</sup> and even today he is frequently quoted (or mis-quoted) in the guidebooks prepared for tourists.

During his sojourn in southern Louisiana, Charles Lyell journeyed downriver to Head of Passes where the river waters divide into five channels or distributaries, and beyond to the Balize, the pilot-station then situated near the mouth of Southeast Pass (see Figure 2). On this excursion, he again was accompanied by Dr. William M. Carpenter whose "knowledge of botany and geology, as well as his amiable manners, made him a most

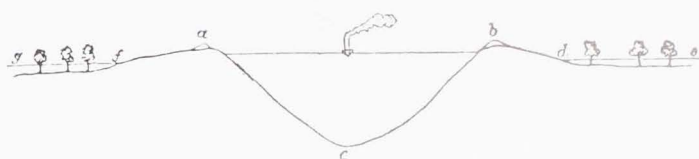


Map of part of the delta of the Mississippi below New Orleans.\*

*a, a.* Post-Pliocene formation, partly marine and partly of cypress-swamp origin, called by Prof. Hilgard 'Coast-Pliocene.'

Figure 2 (from Lyell, 1872, v. I, p. 444)

useful and agreeable companion.”<sup>11</sup> On the 110 mile trip, he had an opportunity to observe the natural levees of the river which then extended only 20 miles below English Turn. He commented on the nature and origin of the “narrow banks, protruded for so many miles into the Gulf of Mexico” with no bluffs present on either bank of that “powerful body of fresh water flowing in a valley more than a hundred feet deep, with vast mounds of mud and sand on each side.”<sup>12</sup> (see Figure 3) He was intrigued by



Section of channel, bank, levees (*a* and *b*), and swamps of Mississippi River.

Figure 3 (from Lyell, 1850, v. II, p. 170)

the relative stability of the banks and bayous or channels as demonstrated by comparison of the terrane he saw with Charlevoix's maps of 1834.<sup>13</sup> His observations failed to yield the evidence he had hoped to find which would enable him to calculate the rate of advance of the delta. However, he did surmise from the reported rates of change in the mud and sand bars restricting main channels during times of reduced flow, that several thousand years would be required for the river to advance from New Orleans to the Balize. Later, using data on the transported solids in Mississippi River waters provided from his experiments by Dr. Riddell and, assuming that the delta had a thickness of 528 feet or one-tenth mile, Mr. Lyell calculated that the 13,600 square miles of delta must have taken about 67,000 years to form. An article on these observations was published later in 1846.<sup>14</sup> Recent research based on modern technology indicates that this calculation is too high by one order of magnitude, but the variables and possible errors in his calculations enumerated by Mr. Lyell can easily account for this difference.

On March 10, the Lyells left New Orleans and began to ascend the river. Mr. Lyell had made arrangements to land at Port Hudson to examine the “fossil forest” in the bluffs there, and Mrs. Lyell went directly to

Natchez where he was to join her a few days later. As he travelled up the river, Mr. Lyell had the opportunity to examine what remained of the “entrance of what is called the Carthage crevasse,” a large break opened in the levee by floodwaters in May 1840, and causing the river to discharge its floodwaters eastward into that “great lagoon” Lake Pontchartrain for a period of eight weeks.<sup>15</sup> Near Bayou Sara he viewed a similar break in the levee from the great flood of 1844. He also saw much additional evidence of the effects of cut-and-fill action on the banks of the dynamic river, and was able to view the horse-shoe shaped oxbow lakes such as Lake Solitude and Fausse Rivière, left behind by the meandering river. Above St. Francisville, they passed the Raccourci Cutoff, a trench nine feet deep dug as an attempt to shorten the navigation channel by 25 miles.<sup>16</sup> The flood waters of 1845 had rushed through the cut with great velocity but had failed to open the new channel. Only two years after Mr. Lyell was there, in 1848, the Raccourci Cutoff opened and today Raccourci Old River is another oxbow lake.

At Port Hudson, Charles Lyell disembarked to examine the geology of the bluffs containing the “fossil forest” described to him by Dr. Carpenter. Unfortunately, the bed of buried stumps was 12 feet under water and the “fossil forest” could not be seen. However, Mr. Lyell was able to find similar though not so ancient buried stumps of cypress trees at higher levels nearby. From his observations he was able to conclude that significant changes in the relative levels of land and sea had taken place, and to estimate the magnitude of this change at 150 feet.<sup>17</sup>

At Natchez, great bluffs of loess stand 200 feet above the river for a distance of several miles. Mr. Lyell noted the resemblance of these deposits to “loess” or “fluvatile silt” in the valley of the Rhine River and commented on the shells of land-snails contained within both “loams” and on the similarity of their lateral passage into lacustrine deposits.<sup>18</sup> He visited the “Mammoth ravine” nearby which was named for the numerous fossils of Pleistocene quadru-

peds recovered there. He suggested, however, that the fragment of human pelvis shown to him was intrusive and had been washed out of "some old Indian grave" farther upstream.<sup>19</sup> He viewed recent landslips on the bluffs and was able to estimate the rate of eastward migration of the river.

At Vicksburg, great bluffs rise above the river similar to those at Natchez, but here beneath the "freshwater loam", Charles Lyell recognized "a marine tertiary deposit, of the Eocene period, in which we collected many shells and corals."<sup>20</sup> (see Figure 4) He

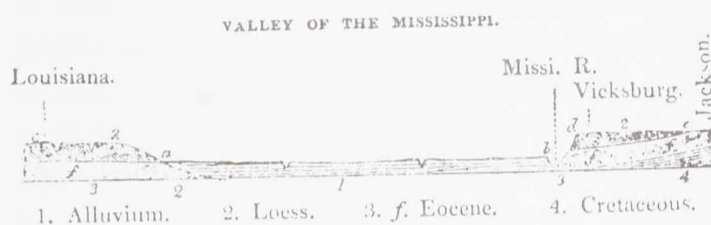
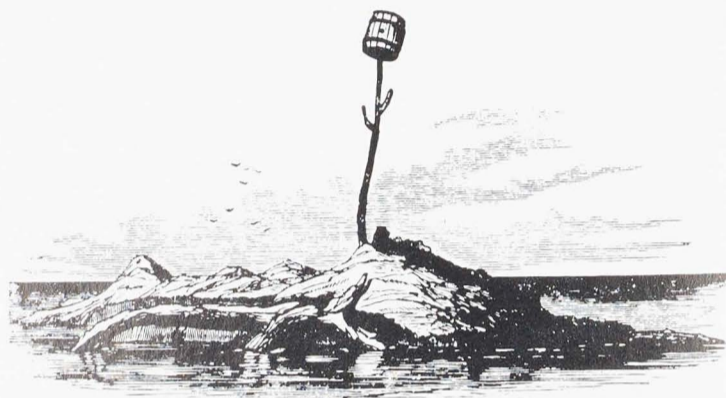


Figure 4 (from Lyell, 1850, v. II, p. 257)

made a trip overland by railroad to Jackson during which he recognized both the "loam" of the Pleistocene terraces and the Eocene strata rising to the surface farther east. From Vicksburg, the Lyells resumed their journey up the river and left the Louisiana area, reaching Memphis on 24 March 1846.<sup>21</sup>

Charles Lyell has been quoted extensively by subsequent writers on Louisiana Geology. The first of these, Marie-Joseph Raymond Thomassy, a French hydraulic engineer, visited New Orleans in 1858-60 and became fascinated with the Mississippi River and the coastal plain of Louisiana. His intense interest and scientific curiosity led him to write the pioneer work on Louisiana geology *Géologie Pratique de La Louisiane*, published in New Orleans in 1860. Near this time, a Creole gentleman overheard some intemperate remarks by Thomassy about the size of the Mississippi River compared to the rivers of France. He was challenged by the Creole, and was forced to fight a duel over the size of the Mississippi River. Thomassy lost the duel but survived with only a painful disfiguring injury to remind him of the incident. He lost, by his own account, because of the "miserable character of your American steel."<sup>22</sup> This event may help to explain his rather strongly critical treatment of

Lyell's observations. In the foreword of his *Practical Geology of Louisiana*. He took Sir Charles to task, as follows (in translation): "Through a mistake, or an oversight equally regrettable, that celebrated geologist did not bring out the part played by *mud springs* and *mud lumps*, springs and mounds of mud, which emerge from the waves of the Gulf of Mexico, sometime even in the middle of the passes of the river, revealing the presence of a new active agent in the progressive formation of the delta."<sup>23</sup> (see Figure 5) Four

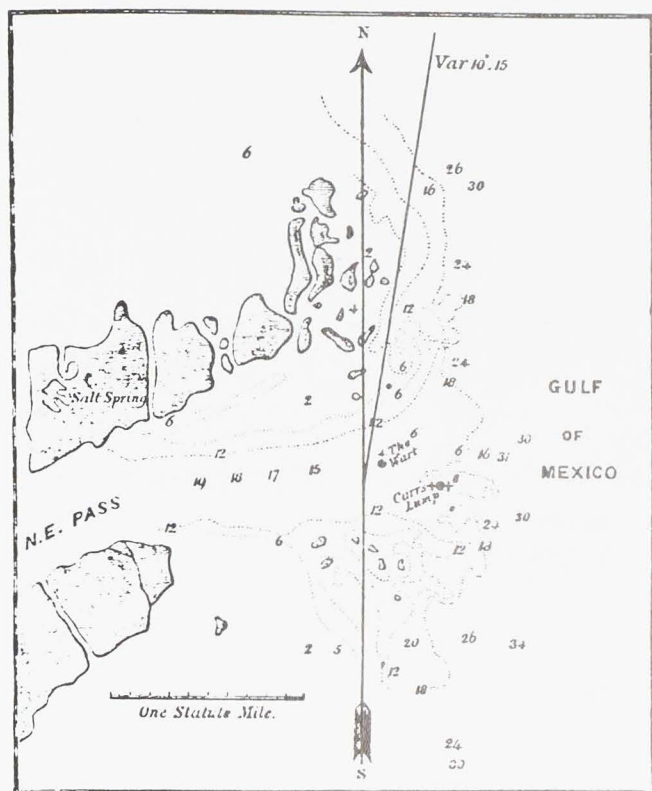


S. View of Carr's Lump, N.E. Pass.  
Extreme height above low water, 8 feet.

Figure 5 (from Lyell, 1872, v. I, p. 446)

times, Thomassy criticizes grave errors of omission, "all the more regrettable on the part of so eminent a mind."<sup>24</sup> It should be recorded that the subject of mud lumps in the passes of the Mississippi River is treated fully in later editions of the *Principles of Geology*. (see Figure 6) Later authors, such as Hilgard (1873) and Harris and Veatch (1899), treated Charles Lyell more kindly and fairly. They chose to comment on his actual observations rather than his apparent omissions.

In summary, the visit of Charles Lyell to Louisiana in 1846 was productive and yielded significant results. Especially noteworthy are his comments on the extended banks of the Mississippi River at its mouths, the nature of and origin of Lake Pontchartrain and Fausse Rivière, his descriptions of the exposed Tertiary strata and the overlying loess deposits in the bluffs near Vicksburg, his views on the "fossil forest" in the bluffs at Port Hudson, and his discussions of the evidences for subsidence and the probable rates of this subsidence in both the Port Hudson area and in the lower deltaic plain of



Map showing the positions of the Wart and Carr's Mud-lumps at the Northeast Pass of the Mississippi River, from a survey of Capt. Talcott, in 1839.\*

Figure 6 (from Lyell, 1872, v. I, p. 445)

the Mississippi River. These calculations and his estimates of the age of the river delta based on its calculated mass volume and Riddell's estimates of annual amounts of river transported solid matter, were quite influential at a time when such matters were poorly understood and controversial. Overall, his observations on the Mississippi River and on other geological features in southern Louisiana were most astute and exerted a strong influence on contemporary and later writers on Louisiana geology. Even today, Charles Lyell is quoted frequently and he continues to exercise a significant influence on the geology of Louisiana.

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