Second Record. Further definite evidence that Rhineodon occurs in the Caribbean came in 1937. The curious behavior of a great shark in the harbor of St. Marc, Haiti, around the steamer *Colombia* of the Colombian Steamship Company, was noted in a newspaper clipping sent me. A letter to the office of the company brought an answer from Pres. C. H. C. Pearsall, who at the time was on the steamer in the harbor of St. Marc. His description of this great fish positively identified it as Rhineodon, and this was verified by his inspection of a photograph in my office.

Mr. Pearsall carefully described the unusual behavior of this greatest of the sharks. It "hung around" the steamer while she was loading bananas under a strong electric light. A number of shots were fired at the unwelcome visitor, but they glanced harmlessly from his body armor of denticle-covered 4-inch skin. Once Rhineodon came up under the companionway, raised its head and dislodged the platform at the bottom of the ladder. The shark was about 25 feet long and when it bumped into the side of the ship, the impact was noticeable. An account of this fish and its behavior appeared in 1939.

Third Record. And now comes another authentic account of a whale shark in the Caribbean. Mr. Arlo Kalsheim, second officer of the tanker *Marathon* of Oslo, Norway, has kindly sent me a letter, via the U. S. Hydrographic Office, Washington, D. C., giving the following data. The *Marathon*, on a passage from Lisbon, Portugal, to Puerto La Cruz, Venezuela, had arrived on January 14, 1949, and anchored in that harbor in the afternoon. The officers were on the bridge awaiting orders from shore, when the captain called attention to a huge shark swimming near the vessel. Mr. Kalsheim writes that it was about 30 feet long and was swimming toward the ship. He had seen my article and figure published in the Hydrographic Bulletin in 1934 and at once recognized the visitor as a whale shark. He wrote that it was covered with spots over its whole body, as the published figure showed, and he estimated the width of the huge mouth at 4 feet. The great shark swam about the ship until dark, feeding on swarms of small fish and on other organisms at the surface. None of the ship's company had ever seen a shark of this size, shape, and color. It stayed on the shady side of the ship and hence it was impossible to take a photograph.

This behavior of the third Caribbean whale shark parallels that of the second specimen noted in these waters and of the two others which were reported by hearsay that could not be verified. This third Rhineodon had no fear of the ship or the crew, who, to a man, were hanging over the rail keenly interested. This behavior is typical of the whale shark. Secure in its armor of 4-inch-thick hide of tough fibers, the adult can be harmed by nothing that swims the seas. It has no enemies but man, and his harpoons and bullets will not penetrate its skin save when this is relaxed and shots are on the perpendicular—at an angle they glance off harmlessly. Man's surest way of killing this sluggish monster is by ramming it with a steamship—and a considerable number of such cases have been reported by the present writer (1940).

Those interested in the habits and behavior of *Rhineodon typus* will find all available material presented in my article, "The Whale Shark Unafraid," published in 1941.

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Some Current Misconceptions of N. L. Sadi Carnot's Memoir and Cycle

Recent authoritative texts state erroneously that Carnot (1824): (a) employed the discredited substantive or so-called caloric theory of heat, (b) discovered the second law without appreciating the first law, and (c) incorrectly pictured the descent of heat (*chute de calorique*) through an engine as analogous to the flow of water through a mill.

These misconceptions have arisen from improper interpretations of Carnot's terms *feu* (flame), *chaleur* (heat), and *calorique* (translated as "caloric" but should be interpreted today as entropy following Brønsted).

Clapeyron (1834) misunderstood Carnot and introduced unnecessary mistakes which Carnot had been careful to avoid. (CALLENDAR, H. L. "Heat" in *Encycl. Brit.*, 1911, *et seq.*). Clapeyron's mistake still dominates the literature a century later.

Kelvin (1849–51) interpreted the three terms indiscriminately as heat and unjustly criticized Carnot's proof. Clausius (1850) was acquainted with the memoir only through the work of Clapeyron and Kelvin. Ostwald (1892, *Klassiker* No. 37) remarked that Carnot used *chute de calorique* consistently when emphasizing the motive power of heat, but *chaleur* for general consideration, never *chute de chaleur.*

Brønsted (1937–47, *Phil. Mag.*, 1940, **7**, 29: 699), has developed a new self-consistent and symmetrical system of energetics in which the reversible transport of any extensive quantity (entropy, mass, electric charge, etc.) through a corresponding conjugate difference in potential (temperature, gravitational or electric, etc.) is necessary for the production of work. (LA MER, FOSS and REISS, *Conference on molecular interaction*, New York Academy of Sciences, Am. N. Y. Acad. Sci., 1949, 51, Art. 4).

Carnot's cycle thus represents the conversion of thermal energy (TS) into mechanical work A by the fall of entropy through a potential difference ($T_2 - T_1$)

$$\delta A_{\text{thermal}} = \delta S (T_2 - T_1)$$

Brønsted's interpretation simplifies the presentation and renders unnecessary the accepted compensation theory of Clausius developed to harmonize Carnot's ideas (as Clausius understood them) with the first law.

This communication is based on a paper presented at the January 29 meeting of the American Physical Society. A fuller account documenting the assertions will be submitted to the *American Journal of Physics.*

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