The Boston Tea Party

The defiant act that preceded the American Revolution by two years is reenacted several times a day for tourists along the Boston waterfront. Sky & Telescope photograph by Chuck Baker.

Rally Mohawks! Bring out your axes. And tell King George we'll pay no taxes On his foreign tea!

S
O BEGAN a tavern song, popular in Boston one winter long ago. It refers to the famous events of December 16, 1773, when a band of patriots disguised themselves as American Indians and boarded three ships, the Dartmouth, the Eleanor, and the Beaver, at Griffin’s Wharf in Boston harbor. Between 6 p.m. and 9 p.m. the colonists raised 340 heavy chests from the ships’ holds, cut them open, and threw overboard 90,000 pounds of tea.

Ideally, to destroy the tea most effectively, the colonists should have carried out their plan just after a high water in the harbor, with a strong current flowing out to sea. But legal considerations (rather than optimal tide conditions) actually set the date and time of the Boston Tea Party. British customs officers were authorized to seize the valuable cargo if the duties were not paid “within twenty days after the first entry of the ship.”

The first tea ship had arrived in Boston on November 28th, and the deadline was apparently deemed to fall at midnight on the night of December 16–17. During a late-afternoon session at Old South Meeting House on the 16th, the colonists learned that last-minute negotiations with British Governor Thomas Hutchinson had failed. Amid cries of “Hurrah for Griffin’s Wharf!” and “Boston Harbor a tea-pot tonight!” the meeting broke up, and the colonists went ahead with the destruction of the tea.

As to what happened next, a number of eyewitness reports were collected by historian Francis S. Drake for his work Tea Leaves (Boston, 1884). For example, Benjamin Burton happened to be in Boston at the time and heard the cry “Tea party! Tea party!” Upon joining the group that boarded the ships,

...he labored with all his might in throwing the tea into the water. It being about low tide, the tea rested on the bottom, and when the tide rose it floated, and was lodged by the surf along the shore.

This unexpected embarrassment — low water off Griffin’s Wharf — figures in another account preserved by Drake:

Henry Purkitt, Samuel Sprague and John Hooten... were apprentices of about the same age. ... While at their work they heard a loud whistle, which startled them, and which they followed till it brought them to the wharf. Their part of the play was on the flats, by the side of one of the vessels, — for it was nearly low tide, — and with other boys, by direction of the commander, to break up more thoroughly the fragments of chests and masses of tea thrown over in too great haste. They found their return upon deck much facilitated by the immense pile which had accumulated beneath and around them.

Purkitt, Sprague, and Hooten said that they spent much of their time on the tidal flats “trampling the tea into the mud.” According to a statement made by Governor Hutchinson, the tide was
This block of four stamps, designed by William A. Smith and issued in 1973 as part of the bicentennial commemoration, is the only illustration known to the authors that accurately depicts the lunar phase at the Boston Tea Party. The crowd on Griffin's Wharf would have seen a thin waxing crescent Moon, 13 percent sunlit, over the southwestern horizon during the first two hours of the Boston Tea Party. The stamps also correctly depict the azimuth of the Moon.

so low during the Tea Party that “three of the vessels lay aground” at Griffin’s Wharf.

Benjamin Simpson, who was a bricklayer’s apprentice, likewise recalled how the colonists

... went on board the ships, then lying at the side of the wharf, the water in the dock [being] not more than two feet deep. They began to throw the tea into the water, which went off with the tide till the tea grounded. ... I was on board the ships when the tea was so high by the side of them as to fall in, which was shovelled down more than once.

THE TIDES AT BOSTON

Initially, our intent was simply to check the lunar phase and the moonlight during the Tea Party, for the existing literature gives confusing and contradictory accounts. Almost all possible lunar phases are mentioned or portrayed, as is apparent from the images reproduced above and on the next page.

However, during our computer calculations, we noticed something else very interesting related to the Moon’s gravitational pull and its effects on the tides during the Tea Party.

In Boston harbor the mean range of the tides is about 9.5 feet. Spring tides are those of increased range occurring twice monthly as the result of the Moon being in syzygy (that is, either new or full), when the tide-raising forces of the Moon and Sun combine for a greater net effect. At Boston, the spring range averages about 11.0 feet. Perigean tides of increased range also occur monthly when the Moon is at perigee (nearest Earth) and the lunar tide-raising force is greatest.

If the time of lunar perigee falls near a syzygy, then perigean spring tides of unusually large range can occur. We discovered that this is exactly what happened in the middle of December 1773:

Lunar Perigee  Dec. 13, 1773 (8° UT)
New Moon  Dec. 13, 1773 (22° UT)

To calculate the effects of this near-coincidence we used computer programs based on harmonic analysis of the tides, as described previously in this department (S&T: April 1992, page 437). Our results indicate that the tidal range in Boston harbor exceeded 14 feet during the four-day period beginning December 13th, with the maximum range, 14.7 feet, on the 14th. Such extreme tides occur only a few times per year in Boston harbor.

In fact, we ran the programs for the entire year of 1773 and found tide ranges this great only during three periods (early May, mid-November, and mid-December), each of which followed a near-coincidence of lunar perigee and syzygy.

It is worth emphasizing that perigean spring tides have greatly increased range, bringing both extremely high tides and extremely low tides on the same day.

Using the harmonic-analysis program, we calculated the following schedule of times:

**BOSTON HARBOR TIDES**
(Local apparent solar times)

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Tide</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dec. 16, 1773</td>
<td>12:59 p.m.</td>
<td>high water</td>
</tr>
<tr>
<td>Dec. 16, 1773</td>
<td>7:23 p.m.</td>
<td>low water</td>
</tr>
<tr>
<td>Dec. 17, 1773</td>
<td>1:39 a.m.</td>
<td>high water</td>
</tr>
</tbody>
</table>
R. T. Hewes describes the scene during the next low tide:

"Early on the morning of the 17th, a long windrow of tea, "about as big as you ever saw of hay," was seen extending from the wharves down to the castle [Castle Island]. A party of volunteers soon turned out in boats, and stirred it up in the "pot" pretty effectually.

The graph on page 84 shows that the evening low water fell almost exactly in the middle of the Tea Party. During this period of perigean spring tides, all the low waters were lower than normal. Adding to the colonists' incredibly bad luck, it was the "lower low water" (that is, the lower of the two low tides on December 16th) with which they were confronted!

THE MOON'S PHASE

During the evening twilight on December 16, 1773, our calculations show that the Moon must have appeared as a thin waxing crescent, 13 percent sunlit, above the southwestern horizon. The Moon set at about 7:45 p.m. Eastern Standard Time, which corresponds to 8:04 p.m. local apparent solar time (the United States did not adopt standard time zones until 1883). In fact, we have located six colonial almanacs published in Boston for 1773 — those by Nathaniel Ames, Isaac Bickerstaff, John Fleeming, Ezra Gleason, Nathaniel Low, and Samuel Stearns — all of which predicted moonset on December 16th between 8:02 and 8:08 p.m.

Therefore, the Moon was in the sky during the first two hours of the Tea Party, but the slender crescent would not have thrown much light onto the scene. Indeed, several accounts mention the use of lanterns brought by the colonists or borrowed from the ships' crews. As Robert Sessions, a young laborer in Davis's lumberyard, recalled:

On that eventful evening, when Mr. Davis came in from the town meeting, I asked him..."
what was to be done with the tea. “They are now throwing it overboard,” he replied. Receiving permission, I went immediately to the spot. Everything was as light as day, by the means of lamps and torches; a pin might be seen lying on the wharf. I went on board where they were at work, and took hold with my own hands. . . . Other young men, similarly circumstanced with myself, joined them in their labors. The chests were drawn up by a tackle,—one man bringing them forward, another putting a rope around them, and others hoisting them to the deck and carrying them to the vessel’s side. The chests were then opened, the tea emptied over the side, and the chests thrown overboard. . . . Entire silence prevailed,—no clamor, no talking. Nothing was meddled with but the teas on board.

DÉJÀ VU

In 1993, as in 1773, a new Moon will occur on Monday, December 13th. The following Thursday, at 6 p.m. local civil time, a thin waxing crescent Moon will stand 18° above the southwestern horizon, as it did on the corresponding night 220 years ago. The Moon this year will set at about 8:01 p.m.

Because the near-coincidence of new Moon and lunar perigee will not repeat in 1993, the tide range this year will not be so extreme. But the evening low water on December 16th will again fall between 7 p.m. and 8 p.m., just as it did on that historic night, when the astronomical alignment and the unusually low tide caused so much trouble for the American patriots.

We are grateful to Ed Wallner for help in checking our tide calculations. The standard modern reference for historical facts surrounding the event is Benjamin Woods Labaree’s Boston Tea Party (Oxford University Press, 1966).

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