CONFERENCE ISSUE

the TIDE MILL TIMES

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TIDE MILL INSTITUTE

www.tidemillinstitute.org

Committed to Sustainable Industrial Heritage

BOSTON FEATURED AT TMI's TWELFTH CONFERENCE

TMI's twelfth annual conference was held in the spectacular Metropolitan Waterworks Museum in Boston's Chestnut Hill area. Over 60 participants were treated to several presentations offering broad-view descriptions of the tides and of millstones. Five different historians and architects approached the history of Boston's early tide mills from five different directions, offering an intensive case study of tidal industry and how it changed the shape of the city.

We hope the summaries of each presentation and their images that are offered in this issue give our readers a sense not only of that heritage, but also a feel for the presentations themselves.

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TMI's NEXT CONFERENCE IN PORTLAND, OCTOBER 27-28

TIDE MILL INSTITUTE's next conference will be held next fall October 27th-28th at Stroudwater in Portland Maine, adjacent to the site of an early and unusual tidal grist mill. We plan another intensive study of a region's tide mill history, exploring how five different Portland sites made use of the tides. And we hope to have a several short, informal presentations that offer a range of insights into tide mill heritage from different perspectives. As in the past, low tide visits to early tide mill sites will be a special feature of the gathering. Mark your calendars now, save the dates and let us know if you can offer the story of a tide mill that once operated in your own back yard, wherever it was!

JUNE TIDAL ENERGY CONFERENCE IN FRANCE

Bud Warren, president of TMI, has been asked to be a member of the scientific committee of a group planning an international interdisciplinary colloquium on the topic "Tidal Energy Yesterday, Today and Tomorrow," to be held June 20 to 22nd in Rennes, France. The conference will focus on "potential" tidal energy, that is, energy based on the water height on both sides of a causeway or dam. There will be two days of papers and a day trip to the Rance estuary, site of the huge tidal barrage that has operated there since 1966.

2016 CONFERENCE PRESENTATIONS

(with the photos they used)

JONATHAN WHITE

TIDES

Jonathan White , writer, conservationist and surfer has a love affair with the tides and has traveled around the world to study them. Years ago, after grounding a sail boat in the Alaskan low tide mud, he began to read and write about the tides. To kick off this year's conference, he expressed that enthusiasm passionately and lyrically as he told his story and shared some of the amazing facts he's uncovered in a decade of study. [The tidal bore on China's Qiantung River, called "The Dragon," is sometimes as high as 25 feet, happens on every tide every day of the year; and the world's first tide chart was carved on a stone tablet to predict its arrival; the tide is a large long wave that travels around the world at the speed of a modern jet – 450 miles an hour; tides are even slowing down the Earth's rotation!]

White described some of the fascinating places he's visited around the world to understand how the tide works, and how it has influenced culture: Panama, where 350 islands will disappear in the next half century; fabled Venice, whose plazas now flood ten times a year; the tide wrapped island of Mont San Michel where he talked with the monks; tidal power sites in the Orkney Islands, the Strait of Magellan, and Eling in Hampshire England, where he met miller David Plunkett, an old friend of TIDE MILL INSTITUTE and worked a tide with him in Eling's centuries-old tide mill learning close-up about process of milling flour tidally.
In the last section of his presentation, he explored the astronomy and fluid dynamics of tides describing how ancient cultures might have sensed them and how they were interpreted by early mathematicians and scientists. He finished by discussing the concept of *resonance* between the moving ocean waters, the sun and moon, and even of singing in the shower!

Low & high tide at Perranporth, Cornwall England

The "Dragon" at work

White's book about his experiences, appropriately titled *TIDES*, will be published this February.

Above photos courtesy: http://jonathanwhitewriter.com/media/

Photos of speakers by John Goff

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CHARLES HOCKENSMITH

THE AMERICAN MILLSTONE INDUSTRY

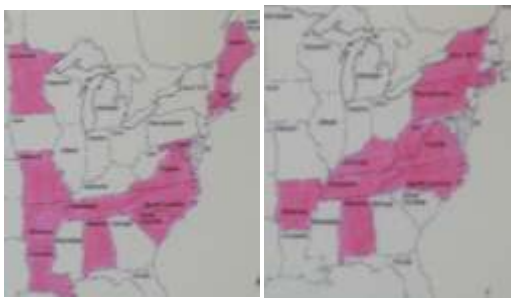
Charles Hockensmith, a retired archaeologist and president of the Kentucky Chapter of SPOOM, is a world-renowned expert on millstone quarrying, particularly in the Kentucky and southern Mid-Atlantic area. He described the geography of quarries in the eastern states of America and the two *kinds* of stones commonly produced in the United States, faced grinders or standard millstones that operated horizontally in pairs (both monolithic and composite) and edge runners that ran vertically to crush materials. He listed the different *types* of stone used – conglomerate, flint or burrstone, sandstone, granite or granite boulders of the right shape and pointed out where there were quarries of each type. Hockensmith also discussed the most commonly used foreign millstones- the French Burr, German Cullin stones, and English conglomerate stones.

Of particular interest were the many photographs showing millstones in the process of being quarried and shaped, most unfinished stones being between 32" and 46" in diameter and 6" to 28" thick. Hockensmith discussed the various types of remains (millstones, drilled boulders, shaping debris, and quarry excavations) found at the six conglomerate millstone quarries that he documented in Powell County, Kentucky. He then offered a proposed manufacturing sequence based on the abandoned millstones at the quarries.

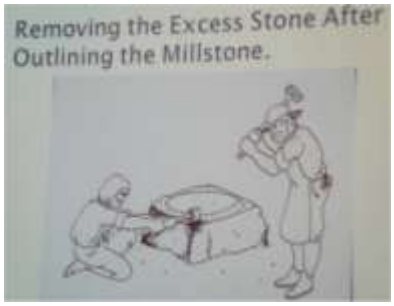
After a suitable slab or boulder was selected, a circle would have been marked on the upper surface of the rough stone from the center. The bulk of the excess stone would then be removed from beyond the circle. Next, the upper surface of the millstone would be leveled with special hammers. The subsequent step was to straighten the vertical sides of the millstone using a square and small hand tools. The final step was to cut the eye or central hole. A stonecutter carefully cut the eye half way though the stone. It was then turned over and cut through the other side. Sometimes mistakes were made when shaping the millstones and the stones would have to be left at the quarry. Many stones broke as the eye hole was being cut it. A number of unfinished stones were pictured still in situ, something irregular having occurred in the shaping, or there were other fractures in the material during the process. These stones, too would be scrapped. Hockensmith said he had found 229 unfinished stones in the forested landscape.

All the American millstone quarries have died out, and the landscape has reverted back to forest.

References to several of Charles's writings about millstones can be found on page 13. Our thanks to Robert Miller for his notes of this presentation.



Location of quarries in the US - Granite (L) Conglomerate (R)



This millstone probably split when the eye was cut.

Virginia millstone quarrymen near Blacksburg.

NANCY SEASHOLES

BOSTON'S MILL POND

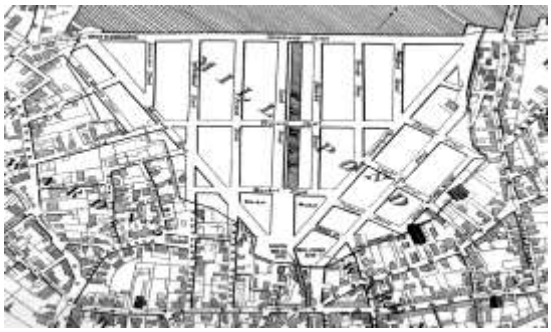
Nancy Seasholes, a historian and independent scholar, knows more than anyone else in the world about Boston's "made land." She shared some of that knowledge as she told the fascinating story of Boston's Mill Cove, its great Mill Pond and how that area has changed through the centuries.

Boston was originally almost an island, connected to the mainland by a narrow spit of land. In 1642, some local entrepreneurs dammed off one cove to create a large mill pond on which several tide mills were built to serve the city. Over time as the pond silted and its waters fouled, it was filled to create about 43 acres of new land which became available for the city's needed residential and commercial expansion. Nancy used maps, paintings, and photographs to show the process.

Of particular interest were her stories about Boston's "Big Dig" highway project through the area and photographs of archaeological work done at the time to document features of a mill at the south end of the pond and interpreted the placement of other structures in the vicinity at the time. A sequence of maps showing the area's relationship to the city around it added breadth to the presentation.

Boston was originally a peninsula

The Mill Pond and its mills



How the Mill Pond was filled

Filling the Mill Pond

Modern Boston covers the Mill Pond area

LEITH SMITH

ARCHAEOLOGY AT MILL CREEK

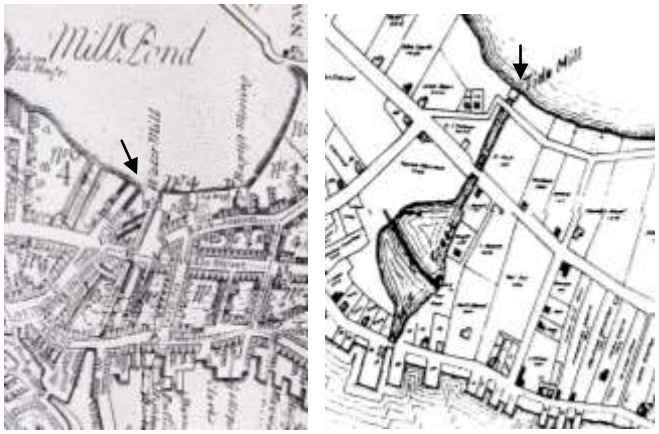
Leith Smith got a phone call one day when he was the project archaeologist for Boston's "Big Dig." Workers some fifteen feet underground (!) had run into something unusual. The specific location was at the south end of Boston's Mill Pond at the north end of Mill Creek, right where early maps indicated a tide mill in existence as early as 1649.

Smith took his audience on the step-by-step process of handling and analyzing this and other found items. Careful work in the area eventually exposed a number of other significant tide mill artifacts, including segments of a face gear, a well-worn spindle from a lantern gear and other millstone fragments. As the archaeologists worked, additional cultural items appeared – part of a timber-lined stone wall from Mill Creek, many broken pieces of then-new seventeenth-century crockery from what had been a nearby retail establishment of the period - and even an old shoe!

The mill gear segments were carefully measured, studied and then set up in an exhibit, and a CAD model prepared (see next presentation). The millstone has been mounted in an above-ground display on a sidewalk on Boston's busy Blackstone Street, just above where the tide mill once stood.

The millstone *in situ* as found – 15 feet below the surface!

Removal of the millstone



Two maps showing location of the tide mill

Gear segments during study

The millstone *in situ* above ground – now

CHARLES PARROTT

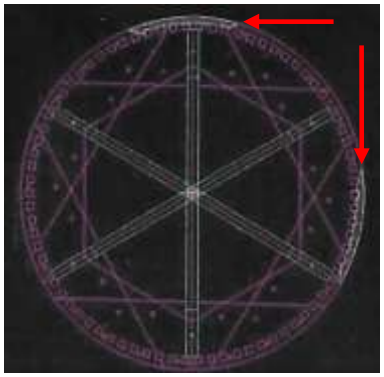
CHANGING WATERWHEEL TECHNOLOGY IN BACK BAY & MILL COVE

Winner of a U.S. Department of the Interior's Superior Service award for his years of work on mills and other projects at the Lowell National Historical Park, historical architect Charles Parrott illustrated the procedure he used to determine the configuration and design of the big face gear at the Boston Mill Cove's South Mill from the two small pieces of it found during the "Big Dig" salvage archeology project (see Leith Smith's presentation above).

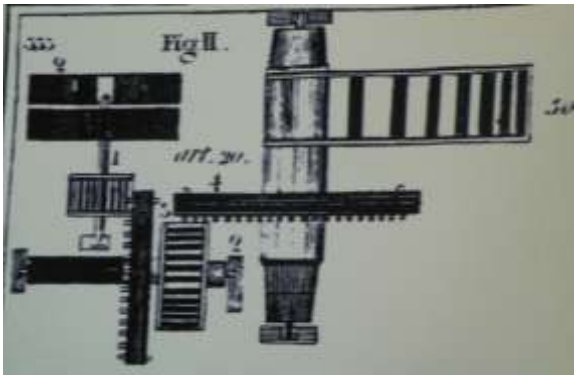
From that Chuck explained structural and operational characteristics of vertical water wheels and the gear trains they drove, in systems incorporating wooden face gears of similar size and construction before material and motive power began changing in the early years of the 19th century such as with the breast wheels used at the Bay mills.

He then described his process of designing and CAD modeling the conjectural mill work that incorporated his virtual reconstruction of the South Mill's big face gear, complete with the paired little face gears and wallower and trundle lantern gears, wooden and wrought-iron shafting, two pair of granite mill stones and the large wooden undershot water wheel.

Although this virtual 3D imaging of the mill work currently exists only in static form, it is hoped that it eventually can be used to animate the CAD model of the South Mill's machinery so that it can be viewed turning once again! .

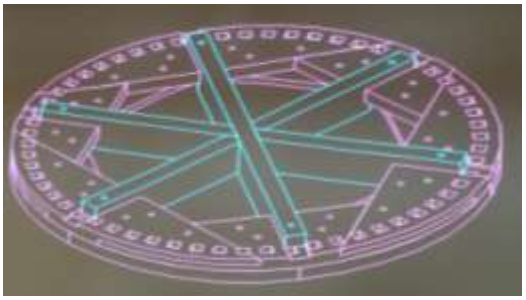


Arrows in this image point to the two wheel segments found during the the"Big Dig" project

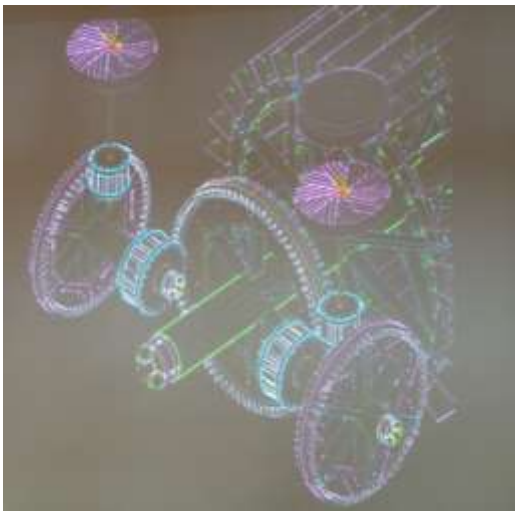


Early drawing of wooden mill machinery

Photo of similar wooden machinery



CAD image of the wheel



The completed 3D image of the 17th century machinery

PAT MALONE

PERPETUAL POWER IN BACK BAY

Pat Malone, industrial scholar and former president of the Society for Industrial Archaeology, presented significant new information about the Back Bay tide mills based on extensive archival material explored in depth only recently. The two- basin concept for the project was developed in 1813 after the 1807 filling of Mill Pond as Boston felt the need for industrial development and grist mills.

A group of men responded to create the project, a long dam westward from Boston, topped by a road and a cross dam, dividing the area into two basins. One key proponent touted that there would be as many as 81 tide mills! The project was supported by the legislature, but opposition came from those concerned about losing valuable salt marsh and from other NIMBY melements.

A number of successful industrial operations were developed, but never as many as hoped for, and the available amount of power didn't come close to original estimates, though the two-basin design did work well enough to allow mills to run night and day.

Embankments for two railroads that were allowed to cross the basins hurt water flow, increasing backwater, and sewage emptying into the basin could not be flushed out.

As with Boston's earlier Mill Pond, creating new land for real estate development was more profitable than revenues for leasing water power, and improvements in steam engines made tidal power less attractive; so over time the basins were filled and Back Bay became what we know today – a residential and commercial area.

Map showing the two-basin plan for Back Bay

Back Bay tidal industry

Railroads crossing the basins created problems

Back Bay (upper left) in 1857 from the State House

ROBERT GORDON

BOSTON
PERPETUAL
POWER

Bob Gordon, an expert in America's early industry, examined environmental and engineering issues and the technology legacy of the Back Bay project.

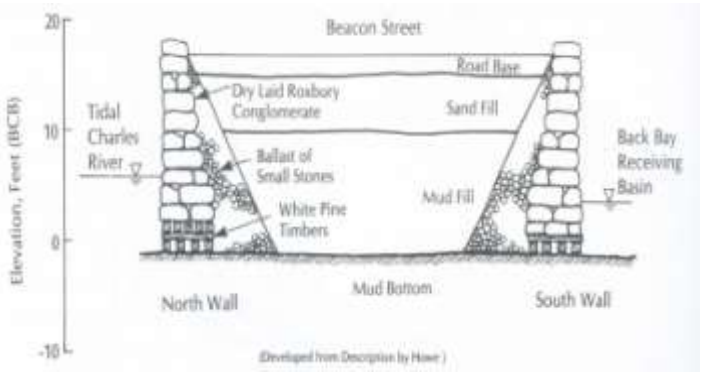
What was planned was a large intrusion into the estuarine environment where extensive salt haying was an important activity. Some construction problems in the marshy terrain happened, and some subsidence of the dam and roads occurred, but did not last. The project's profits were to be based on the amount of water power they could sell; but they had trouble defining the actual amount delivered.

The actual amount of available water became an issue as intrusion by railroad embankments decreased water flow and inadequate sluices for draining the empty basin caused backwater problems for mills.

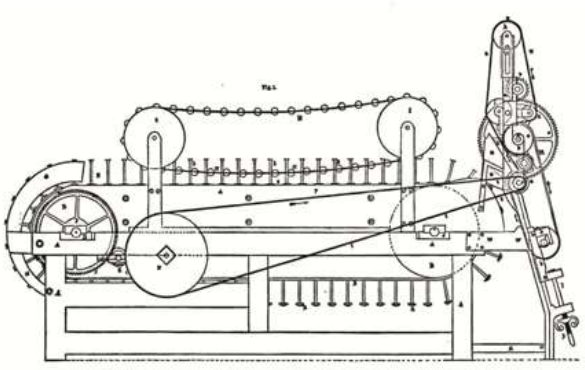
Litigation by those complaining of inadequate power and the inability to clearly define what was indeed available was an ongoing struggle. Causes for demise of the project were twofold – low power production per acre and the inability to use the full power potential of the tide.

Yet for 30 years these dams and basin were not a failure – they supplied pollution-free energy to Boston while sustaining energy-intensive industries at a reasonable cost before the Back Bay was filled.

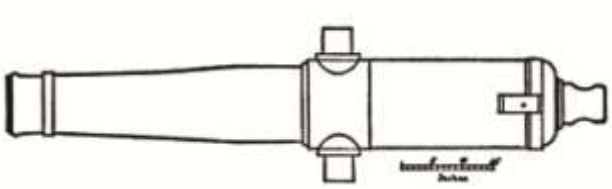
Salt marsh haying – Brighton



Structure and Foundation conditions for the Mill Dam



Roving machine powered by Back Bay tidal power



Steel cannon manufactured on the Mill Dam in 1845

Supplying material to fill Back Bay

CONFERENCE PHOTOS –

Through these gates . . . Waterworks Museum

Dennis DeWitt invited us

Getting ready

Registrar Bob Goodwin is ready

Doug Morrill and Carolyn Marks,
Souther Tide Mill stalwarts are ready

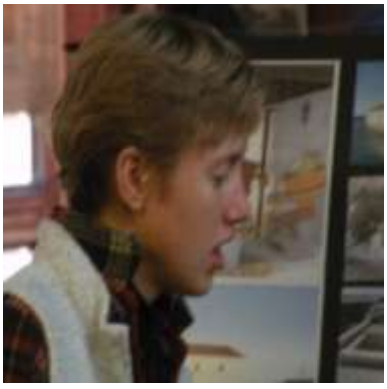
Nancy and Leith confab before the event

Deane and Pat help speakers get ready

Jonathan White & his editor get ready

Listening intently

Enjoying



Checking out the exhibits

Technical guru - Deane

Treasurer Earl

Leader Bud

~ BOOKS OF INTEREST by Speakers at TMI's Conference ~

MILLSTONES

Researchers desiring additional information about the millstone industry can consult the following books by **CHARLES HOCKENSMITH**.

Ball, Donald B. and Charles D. Hockensmith

2007 ***Millstone Studies: Papers on Their Manufacture, Evolution, and Maintenance***. Published by the Symposium on Ohio Valley Urban and Historic Archaeology, Murray, Kentucky and SPOOM, the Society for the Preservation of Old Mills.

2009 ***The Millstone Quarries of Powell County, Kentucky***. Contributions to Southern Appalachian Studies 24. McFarland Publishing, Jefferson, North Carolina and London.

2009 The Millstone Industry: A Summary of Research on Quarries and Producers in the United States, Europe, and Elsewhere. McFarland Publishing, Jefferson, North Carolina and London.

1999 ***Millstone Manufacture in Virginia: Interviews With the Last Two Brush Mountain Millstone Makers***. Society for the Preservation of Old Mills, Newton, North Carolina. Printed by Marblehead Publishing, Raleigh, North Carolina.

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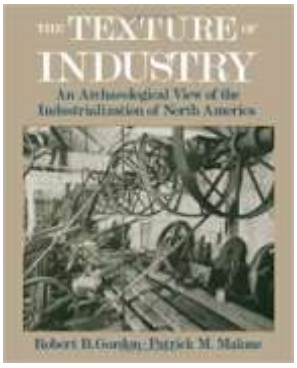
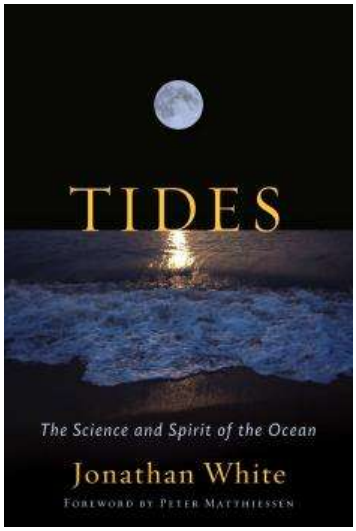
ANALYZING INDUSTRIAL TECHNOLOGY



This 1994 collaboration between authors **ROBERT GORDON** and **PATRICK MALONE** matches the style of their TMI conference presentations about Back Bay tide mills and suggests useful ways to interpret archaeological findings. It explores links between different forms of manufacture at particular periods, arguing that we learn much, for example, about an eighteenth-century, tide mill if we interpret it as a similar enterprise to examples of other contemporary industrial technology rather than as an isolated entity.

TIDES



JONATHAN WHITE's story of his quest to understand the tides was just published in early February. Those who attended our recent conference will enjoy a broader view of what you heard in Jonathan's presentation

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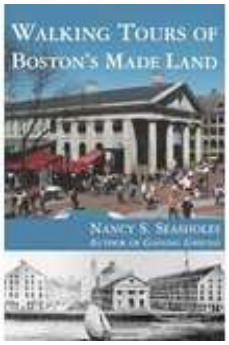
BOSTON'S "MADE LAND"



Two books by **NANCY SEASHOLES** are excellent sources of information about the history of land in Boston and offer insight into the history of the city's tide mills. One is the first complete account of when, why, and how this land was created. The other is a guide to walking tours of the modern city, outlining twelve walks that trace where and why much of that land was created.

FROM TIDES . . . by Jonathan White

Jonathan White read the following excerpt from his book *TIDES* as part of his presentation at our recent conference. We thank him and his publisher for permission to share it with our readers.

(J.White photo)

In 2013 I took a two-hour train ride from London to see the Eling Tide Mill, which has straddled the mouth of the Bartley River near Southampton for 230 years. From the train station, a cabdriver shuttled me through progressively smaller villages and narrower streets until he stopped in front of an un- assuming red-brick building. I stood on the seashore street for a few minutes after the cab left, taking in the building and the estuary . The tide was on its way up, slipping under fifty or more boats crowded into the anchorage. Many were still aground and listing in the mud, their masts leaning every which way. I imagined sailing ships laden with raw corn and wheat standing off the estuary during the mill's heyday in the eighteenth and nineteenth centuries, waiting for enough water to float them in. At high slack, they would have sailed in, tied off to the mill just long enough to exchange raw goods for flour and set sail again before getting caught by the falling tide. Raw goods were also brought from inland by horse and carriage across the one-lane bridge that still connects the mill with the rest of Eling.

The mill itself has three floors and a steeply inclined slate roof. It was built in 1785, but there's evidence that the site may have supported two corn mills, one of them fueled by the tide, as early as 1086. The present building, damaged and restored several times, is now under the care of the Town Council, which manages a museum in the old miller's quarters as well as the operation of the mill itself, which today produces a monthly average of 1,700 pounds of whole meal brown and strong white flour. Some of this is baked into breads and cookies sold in the museum gift shop, and the balance is sold to local bakeries. The three-pound bags for sale at the museum boast "Canute 100% Stoneground: Milled from English bread-making grain for a fuller flavor at the only working tide mill in the United Kingdom." On the back is a recipe for a "delicious 2lb loaf."

The Canute packaging is a reference to King Canute of England, Denmark and Norway, 995-1035 CE. Legend has it that to dispel his court's claim that he was powerful enough "to command the tides of the sea to go back," Canute directed his throne to be carried to the seashore – ostensibly near Southampton – and sat as the tides came in, commanding the water "to advance no farther." When the tide paid no heed, the king's point was made: sovereign power might be great, but nothing was greater than the hand of God. Indeed, during Canute's day the cause of the tide was still a mystery.

Today the lead miller is David Plunkett, a retired stonemason with deep-set blue eyes and ruddy cheeks. I had missed the previous tide cycle, and the next wouldn't start until six o'clock that evening, after the building was closed. Plunkett, however, invited me to stay. He and his apprentice, Andrew Turpin, would run the mill and I would be put to work lifting sacks of grain and refilling the grist bin.

After returning from a dinner of stew and beer at the local pub, Plunkett flicked the tide gauge with his thumb. "We'll be ready to fire up the wheel in about fifteen minutes," he said as he pumped grease into the main waterwheel's brass cap and donned a white apron. Turpin grabbed a bag of raw wheat supplied by a local farm and asked me to pour two scoopfuls into the grist bin. The two them walked through the building, methodically adjusting valves, cables, and the two four-foot grinding stones, each weighing a ton, fabricated in France of composite granite. The massive timber-framed structure, some of it cobbled together or partially eaten by insects, reminded me of an old ship. As if below decks, I had to duck under low-slung oak beams and knee braces.

"Here we go," announced Plunkett as he turned an iron valve opening the sluice gates. Laboring at first, the wheel eventually rumbled to speed. The whole place seemed to come alive, creaking and groaning like a ship at sea. Windows shook. Iron latches and levers rattled. A spoon and pencil chattered in a jam jar. Upstairs, the grist bin's *tick tick tick* confirmed that the grain was

being fed to the grinding stones. When I looked up from the swishing and gurgling waterwheel, a stream of golden flour was pouring from the chute.

The waterwheel ran for four and a half hours.. Through the windows, I watched the tide disappear from the harbor, leaving all the boats aground. The mill's wheelwash gushed into the estuary like a whitewater rapid. Plunkett and Turpin were constantly tinkering with valves, watching, touching, listening. A fine powder had filled the air as soon as we started producing flour, settling on everything, including our eyebrows and lashes. The place smelled like baking bread, hot grease, and low tide.

A few times Plunkett put his hand under the warm flour spilling from the chute. Spreading it on is open palm, he'd run his thumb through it, feeling for temperature and texture. "What we're after is a balance of wheel speed and distance between the two grinding stones," he said. "If the stones are too close, the flour gets hot and sticky. If they're too far apart or we're turning too slow, the flour's coarse."

"How do you know when all the elements are perfectly tuned?" I asked.

"There's a vibration that feels just right," he answered. "I can feel the humming in my skull."

The waterwheel shut down when the rising tide reached its axle and there was too much drag for it to continue turning. I drank a celebratory beer with Plunkett and Turpin at the local pub and caught a midnight train back to London, carrying a bag of fresh Canute Stoneground, flour of the tide. The train's soothing hum reminded me of the tide mill and Plunkett's words: "After fifteen years, I'm still amazed," he said. "There are no engines, no gasoline, no coal, no electricity except for a couple of light circuits. All this is powered by the moon and tides."

From *TIDES*, by Jonathan White, Published 2017 by TRINITY University Press, pp. 229-232.

David Plunkett - J. White Photo

jpegtelegraph.co.uk

Transferred from en.wikipedia

jpegangelfire.com

TMI LEADERSHHIP GROUP MEETS

TMI's officers and advisors met on January 28th for their annual planning session at Robert Gordon's home in York, Maine.

We discussed the varied tide mill activities that had kept us busy over the last year. These included finding a millstone from an early mill on Cape Neddick River in York, a kayaking exploration of several tide mill sites, a visit to the new ocean-wave tank at the University of Maine in Orono, working to restore a working model of a tidal saw mill, extensive archival research on Boston's Back Bay tide mill project, an expedition to search out early small tide mills in downeast Maine, and a visit to the Basin tide mill in Harpswell Maine and the showing of what may be a timber from that mill. There were also reports of various contacts made with people seeking information or assistance from TMI, visits to mills and discussion about various tidal and ocean energy devices. This is a busy group!

Pat Malone was thanked for his great organizing and management of the November conference. Portland ME was chosen as the site of the next conference.

Reports about TMI's 501(c)3 status, the still-developing TMI data base and acquisition of a collection of research about tide mills were presented. A new concept for a "lending library" of books on hand about tide mills and ocean energy was discussed and approved as was an authorization for a membership program for to the organization. Both of these will be presented at a later date.

The Basin Cove tidal grist mill in Harpswell, ME

MYSTERY OBJECT: During the "Sharing" part of our TMI planning meeting, John Goff presented this object for further study. It was found by the water at Basin Cove in Harpswell, ME on June 19, 2016. It is a 2'-9" piece of heavily weathered timber, possibly pine, that seems to have been first cut with a large rotary saw. Measuring nominally 4 x 6 inches in section, and peppered with a zigzag of old nail holes on the back (but with no nails at all in it right now) Goff proposes it might be a rare remnant of the famous 1867 Basin Cove Tide Mill, Maine's largest tidal grist mill. It once stood very close to the artifact discovery site--yet the mill ceased operating after about 20 years, and then stood abandoned about another 20 years until finally blown off and lifted from its post footings by a bad winter storm and tidal surge circa 1907. The timber framed mill first built for the George W. True & Co. of Portland, ME was then very carefully cut apart and dismantled so that some of the longer floor boards and roof boards could be recycled. *Might this little piece have been part of an unrecycled (waste) post or a floor joist---that was fully de-nailed to allow the mill to be taken apart?*

The mystery object

Site where it was found

TMI Membership

Following 12 annual conferences, TMI has established membership categories. Please join now to help support the organization's activities.

Tide Mill Institute Membership

Name_____

Address_____

City,
State,Zip_____

Tel.

_____

Email

_____

Individual $30 _____ Family $50 _____
Supporting $100 _____ Student $10 _____

Corporate $500 _____

Mail this completed form and check to: Earl Taylor Membership Coordinator, Tide Mill Institute

123 Ashmont Street, Dorchester, MA 02124

If you want to use a credit card, please complete the following:

Name on card _____
Type of Card (Visa, MC, etc.) _____

Mailing address for card

_____

_____

Card number _____
Expiration date _____

Security code _____