The Conservation and Preservation of Tabby

A Symposium on Historic Building Material
in the Coastal Southeast

THE CONSERVATION AND PRESERVATION OF TABBY

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A SYMPOSIUM ON HISTORIC BUILDING MATERIAL IN THE COASTAL SOUTHEAST

February 25–27, 1998
Jekyll Island, Georgia

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Cover and above photo of the McIntosh Sugarhouse by James R. Lockhart, Historic Preservation Division staff photographer

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Introduction

Hidden away in the lush greenness of the coastal islands are silent reminders of Georgia's early history. Foundations and ruins are all that remain of the British fortification of Frederica, a town of nearly 1,000 people on Saint Simons Island. From that base Gen. James Oglethorpe led a regiment that fought against Spanish troops and helped ensure English sovereignty in colonial Georgia. In 1736 Noble Jones founded his colonial estate of Wormsloe on the Isle of Hope. He eventually built a home, raised cattle, and planted rice, cotton, and mulberry trees. Today the ruins of his house leave clues and raise questions about life in colonial America. Thomas Spalding cultivated sugarcane on his successful antebellum plantation on Sapelo Island. Ruins of his sugar mill still stand.

What do the fort at Frederica, Jones's home on Wormsloe, and Spalding's sugar mill have in common? All were constructed of tabby.

Described as "the first concrete material made and utilized in the United States," tabby was used by the Spanish at Saint Augustine as early as 1580. South Carolina records report British builders constructing a tabby powder magazine between 1701 and 1713. By 1736 tabby construction found its way to Fort Frederica. Tabby, a mixture of shell, lime, sand, and water, became a common building material on the Georgia and South Carolina coasts. Major factors in its final demise were the Civil War and the introduction of portland cements. By the early twentieth century, the use of tabby as a traditional building material ended.

Tabby structures and ruins still can be found in coastal Georgia, South Carolina, and Florida, but their numbers are diminishing. Attempts to stabilize or restore them have been hampered because there is little information about the long-term effects of preservation treatments. As coastal areas develop, as modern environmental factors affect historic materials, and as time simply passes, tabby structures deteriorate. Public and private stewards of these resources want to know how to protect them.

To address these issues, the Historic

Preservation Division of the Georgia Department of Natural Resources applied for and received a grant from the National Center for Preservation Technology and Training. The result was "The Conservation and Preservation of Tabby: A Symposium on Historic Building Material in the Coastal Southeast." Project cosponsors included the Historical Services Division, South Carolina Department of Archives and History; Division of Historical Resources, Florida Bureau of Historic Preservation; and the Museum and Historic Preservation Division of the Jekyll Island Authority.

From February 25 to February 27, 1998, forty invited participants from across the country met on Jekyll Island, Georgia with the common goal of preserving tabby resources. An intensive two-and-a-half days of presentations, tours, and discussion resulted in a major step forward in pulling together a body of knowledge on tabby and its treatment.

Key to reaching the symposium's goal was the bringing together of people from various backgrounds and disciplines. Combining the knowledge and experience of architects, archaeologists, craftsmen, landscape architects, engineers, architectural conservators, geographers, site managers, and preservationists was invaluable in discovering what is known and what still needs to be known about tabby preservation.

The importance of this approach clearly can be seen in the symposium proceedings. Individual papers reflect the diverse intellectual focus taken by different disciplines when studying a specific topic, in this case, tabby. To appreciate better the individual work of symposium participants and to reflect their disciplinary origins, papers retain their original reference styles. Despite the multidisciplinary breadth of the collection, however, certain common themes and recommendations emerge. When taken as a whole the proceedings provide a major insight into the current body of knowledge about tabby and its treatment. Papers begin with the geographical distribution of early tabby and then highlight remaining resources in Georgia, South Carolina, and Florida. Physical characteristics of tabby are discussed, and treatment approaches used on specific projects identified. Some of the papers have been modified slightly from their original presentation but remain true to the intent of the original.

Besides coming to an understanding about current scholarship, participants were asked to identify what still needs to be studied in order to better preserve these resources. At the symposium's closing session, discussion groups determined the areas in which additional inquiry is needed. These included historical research, materials characterization, site investigations, preservation plans, and information dissemination. A synopsis of the groups' findings is included in the conclusion of the proceedings. It is hoped that graduate students and other scholars will take these suggestions and turn them into research topics.

To carry out a project such as "The Conservation and Preservation of Tabby," the support and effort of many people are needed. Of crucial importance is funding. A grant from the National Park Service's National Center for Preservation Technology and Training made the project possible. NCPTT Executive Director John Robbins and Board Chair Dr. Elizabeth A. Lyon were supportive from the time the idea for a tabby symposium was first conceptualized. NCPTT staff members Paula Cook and Frances Gale were always available to provide assistance, and the National Park Service's Grants Administrator Stephen Newman was always helpful. Most especially, thanks goes to Dr. Mary F. Striegel, who served as a guide throughout this process and whose advice always proved sound and ensured a better product.

Adding to the quality of the symposium was the meeting's setting, which allowed participants to focus intensively on the topic and to study tabby resources in their original location. The hosts on Jekyll and Saint Simons islands were more than hospitable. Without the support of Warren Murphey and Vickie Wildes of

the Jekyll Island Authority, Patty Henning of the Jekyll Island Club Hotel, Linda King and the Coastal Georgia Historical Society, Ruby Lee Nicholson and the Cassina Garden Club, and Cathy Lambert, this project would not have been possible. Visiting some of Georgia's resources and making tabby using Thomas Spalding's formula were highlights of the symposium. Special thanks go to the National Park Service's Michael Tennent, Dean Garrison, Wally Mathis, and staff from the Fort Frederica National Monument who patiently assisted participants in their experiments with tabby "recipes."

Approaching the study of tabby from a regional perspective that included the tri-state area of Georgia, South Carolina, and Florida was key to the original project concept. Dan Elswick and Walt Marder of the South Carolina and Florida State Historic Preservation Offices effectively brought their state's perspectives to the project. Working with them was a pleasure.

Mark Edwards, director of the Historic Preservation Division and Georgia's State Historic Preservation Officer, was a strong advocate for the tabby symposium and supported staff efforts throughout the process. Special thanks go to Michael Miller who early on voiced the need for this project, Antonio Aguilar who worked in so many ways to ensure its success, and Vivian Pugh who helped make arrangements go smoothly. Other Historic Preservation Division staff who deserve heartfelt thanks are Richard Laub, Jim Lockhart, Dr. Dave Crass, Cynthia Byrd, Sandra Garrett, and Carole Griffith.

The difficult task of compiling the recommendations from the discussion groups fell to ElizaBeth Bede. She is to be commended for bringing order to such diverse material. Jane Powers Weldon, who edited these proceedings, was a constant source of support and wisdom. Carole Moore is to be thanked for bringing her graphics skills and patience to the project.

Finally, a thank-you goes to all the participants of the symposium who brought to the table their expertise and interest in the preservation of tabby. Many have worked for years to save these fragile resources.

"The Conservation and Preservation of Tabby" was really the first step in a targeted attempt to preserve a vanishing part of the American landscape. It is hoped that these proceedings will help stewards of these resources as well as encourage future scholarship to assist in preservation solutions.

Mary Ann Eaddy
Historic Preservation Division
Georgia Department of Natural Resources
December, 1998

Opening Remarks

Good afternoon! I am Mark R. Edwards, State Historic Preservation Officer and director of the Historic Preservation Division (HPD) of the Georgia Department of Natural Resources. It is a pleasure to welcome you this afternoon to our symposium on the conservation and preservation of tabby in the coastal southeast.

Before acknowledging our principal conference financial support and cosponsors, I want to acknowledge a number of HPD staff members who really made this conference possible. From personal experience, I know that organizing and carrying out a conference of this magnitude is difficult and time consuming. Many Historic Preservation Division hands helped make light work of this conference, and I would like to recognize our staff who worked diligently to get you here today.

They are Mary Ann Eaddy, our technical services unit manager, who really masterminded this conference; Michael Miller, our preservation architect; Antonio Aguilar, our rehabilitation architect; Richard Laub, our community services planner, who will facilitate Friday's closing session; Dr. David Crass, our new archaeological services unit manager; and last, but not least, Vivian Pugh, my personal secretary. Thank you all.

The process of stepping back and thinking creatively about how we will achieve one of five State Historic Preservation Office goals here in Georgia—the preservation and protection of historic resources and historic fabric—should be happening more often. Likewise, conferences of this type should be happening more often, not only here, but all across the country, but they are hindered in part because of lack of financial support. Happily, organizations like the National Center for Preservation Technology and Training (NCPTT) exist and help fill this need. The center, based in Natchitoches, Louisiana, "promotes and enhances the preservation of prehistoric and historic resources in the United States for present and future tecture, historic landscapes, objects and material culture, and interpretation."

We are very pleased to have a number of center personnel with us today: Dr. Elizabeth A. Lyon, chairman of the NCPTT Board; John Robbins, executive director of the center; and Dr. Mary Striegel, materials research program manager. I thank them all for coming to the symposium, and we thank the National Center for its grant support of this project.

The conference is also cosponsored by our close colleagues in South Carolina, in Florida, and at the Jekyll Island Authority. I would like to recognize Dan Elswick,

historic architecture consultant in the Historical Services Division of the South Carolina Department of Archives and History; Walter Marder, AIA, with the Architectural Preservation Services Section of the Florida Bureau of Historic Preservation; and Warren Murphy, director of the Museum and Historic Preservation Division, Jekyll Island Authority.

Very special thanks go to a number of individuals and organizations who helped with a host of issues, including tours and transportation. These include Linda King and the Coastal Georgia Historical Society; Ruby Lee Nicholson and the Cassina Garden Club of Saint Simons Island; Mrs. Cathy Lambert; Michael Tennent and staff of Fort Frederica National Monument; and Vickie Wildes of the Jekyll Island Authority.

For the next few days, we will be immersed in the fascinating world of historic tabby construction. Our goal for this symposium was to bring together a broad, interdisciplinary group of experts and practitioners—craftsmen, archaeologists, architects, historians, and conservators—to discuss the current scholarship in the field of tabby and to determine appropriate future plans to guide scholarship and treatment of these fragile resources.

While tabby itself—shell, lime, and sand—is the simplest of building materials, the issues surrounding its preservation and treatment are complex. We have posed a few of these questions to each of you:

- How should this rapidly deteriorating material be treated and interpreted?

- Conversely, should this material simply be left alone and let nature take its course?

- If treatment is taken, how invasive should it be, or should it have minimal impact?

- Can steps be taken to halt further deterioration? If so, what are these? Who should do this work?

- If restoration is necessary, what standards should be met?

- How do we further protect these fragile resources from the effects of wind, water, and the weather?

Our goal is to try to find answers to these questions through the information you share at this conference. My hope is that we translate this, at our Friday session, into a series of action plans in the areas of future research on conservation topics and preservation treatments. Because as historic preservationists we must grapple with the immediate problems of stabilization, rehabilitation, restoration, and maintenance, I believe our Friday session should also focus on developing specific and detailed consensus protocols and principles for action.

It is a tall order, but I think we are up to it! I want again to thank all of you for caring and participating in what I believe will be a fun, dynamic, and fascinating exchange of ideas.

Mark R. Edwards
Director &
State Historic Preservation Officer
Historic Preservation Division
Georgia Department of Natural Resources

On behalf of the Jekyll Island Authority, I welcome you to the Tabby Symposium. It is with great pleasure that we were asked to host this important discussion, and we are confident that such a gathering will stimulate further discussion afield and help each of us become more aware of the strategies that have been applied to tabby conservation. We hope that a sharing of experience will lead to development of treatments that sustain this resource. Jekyll is an appropriate place to hold this discussion for it has many cultural characteristics that are common to tabby evolution and is a comfortable and enjoyable place for getting together.

The cultural history of Jekyll extends back approximately five thousand years. Continuing archaeological surveys have provided information about several significant sites, presumably seasonally occupied by natives who were largely gatherers. Elevated areas yield much in the form of artifacts that help describe these early periods of cultural history. Pre–European contact natives enjoyed an existence centered around a symbiotic relationship with the features of a barrier island. Fishing, harvesting of oysters and mussels, small game hunting, and manufacturing tools and utensils were all basic to this existence, and little changed during the first few thousand years because needs were simple and relatively easily met.

Though no documentation exists regarding Spanish occupation of the island, the impact of the early European influence was undoubtedly felt in all areas of life for the native. The island was known as Ospo, a Guale Indian word meaning "toward the marsh." Subsequent to Oglethorpe's arrival, it was named Jekyll for Sir Joseph Jekyll, who financed a great share of Oglethorpe's venture. Once Oglethorpe began to establish a military outpost on Saint Simons Island, he assigned Maj. William Horton to establish a support outpost on Jekyll. Major Horton built a thriving plantation and lived here until his death in 1749. The remains of his tabby home are still standing today on the north end of the island. Many other structures were part of this period, and tabby remains can be found in a ruinous state in a number of locations.

Following Horton's death, the island was owned by a variety of people before being purchased by Christophe Poulain DuBignon, a French expatriate, in 1792. The DuBignon family enjoyed a

very successful business raising sea island cotton until the Civil War. With the change in labor dynamics resulting from the war, the plantation was subdivided among several family members. John Eugene DuBignon, great-grandson of Christophe, purchased the southern portion of the island from his relatives, then with his cousin, Newton Finney, consolidated the island ownership again with the express notion of offering the island for sale as a resort hunting club.

In 1886 DuBignon sold the island to the newly formed Jekyll Island Club. Club members included such men as Joseph Pulitzer, J. P. Morgan, William K. Vanderbilt, and Marshall Field. One early club member was Charles Stewart Maurice of Athens, Pennsylvania. A bridge engineer, he was fascinated with the tabby ruins of the island and constructed a tabby revival cottage in the club compound. Additionally he and his family members often spent time trying to "restore" the tabby on the north end of the island. Unfortunately, repairs were made with portland concentrations and accelerated some of the damage to the ruins. Maurice's Hollybourne cottage (1890) still stands and provides an excellent view of tabby revival technique.

The club prospered as a retreat into "splendid isolation," with construction of a clubhouse, support facilities, and cottages for members who desired more spacious accommodations than the clubhouse. Members and their guests enjoyed hunting, horseback riding, skeet shooting, biking, golf, tennis, croquet, and lawn bowling. History was made on Jekyll during the club era when in 1910 the framework for the Federal Reserve Act was drafted in the clubhouse. In 1915 the first transcontinental phone call was inititated from the island by Theodore Vail, then president of AT&T.

In the early 1940s World War II and the accompanying shortages of manpower and materials brought the club era to a close. Members left the island in 1942, and the Jekyll Island Club was never reopened. In 1947 the island was sold to the state of Georgia, which still owns it today. The island is operated by the Jekyll Island Authority. Mandated to be self-sufficient, this management entity has succeeded very well in this responsibility for several decades.

Again, we are delighted to host this esteemed group and look forward to stimulating exchanges of information. In keeping with our mission and our objectives, we look forward to more forums of this type for the important work of conservation and protection of our cultural and our natural resources.

F. Warren Murphey
Director
Museum & Historic Preservation Division
Jekyll Island Authority

Good afternoon. As the materials research program manager of the National Center for Preservation Technology and Training (NCPTT), I would like to welcome you to the conference on the conservation and preservation of tabby.

NCPTT is pleased to fund this three-day meeting through its Preservation Technology and Training Grants program. Currently, NCPTT offers grants similar to this workshop through eight types of grants. They include grants in

1. Information Management
2. Training and Education
3. Applied/Fundamental Research
4. Environmental Effects of Outdoor Pollutants on Cultural Re sources: Research and Treatment Development
5. Technology Transfer
6. Analytical Facility Support
7. Conference Support
8. Publications Support

In addition to the grants program, NCPTT serves as a clearinghouse of information on preservation and conservation, through our Gopher and World Wide Web sites.

NCPTT's executive director is John Robbins, who is with us today. There are three main components within NCPTT, the research component, run by Mark Gilbert; the training component, run by Fran Gale; and the information management component, run by Mary Carroll. The materials research program operates under the research component.

NCPTT supports research, training, and information management endeavors in preservation. We serve the fields of archaeology, historic architecture, historic landscapes, objects and materials conservation, and the interpretation of history.

We are also pleased to have with us today Dr. Liz Lyon, current chair of the Preservation Technology and Training advisory board.

I would like to take this opportunity to thank the Georgia State Historic Preservation Office, its director Mark Edwards, and especially Mary Ann Eaddy, technical services coordinator, for organizing this meeting.

We have our work cut out for us in the next two-and-a-half days as we attempt to understand the current scholarship related to tabby and try to identify new research priorities in furthering our understanding of tabby as a cultural material.

Again, NCPTT welcomes you.

Mary F. Striegel
NCPTT Materials Research Program Manager

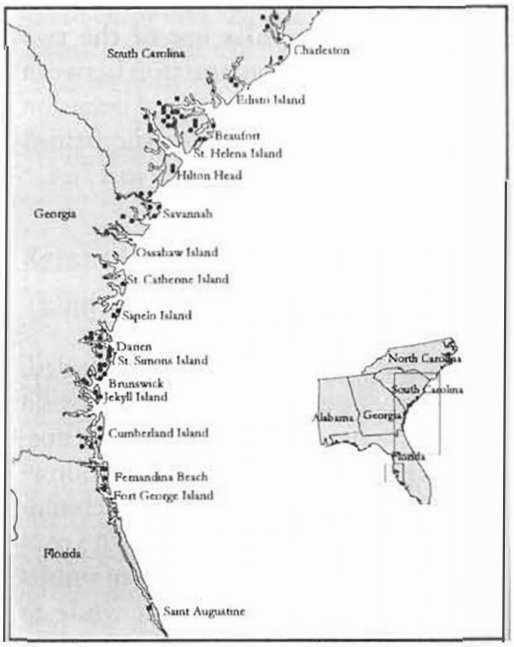
Distributions of Tabby in the Southern United States

A Geographical Perspective

Janet H. Gritzner

The spatial distribution of tabby was limited to a narrow section of the Carolina, Georgia, north Florida, and south Texas coasts. Examples of the material, most of which date from the eighteenth or nineteenth century, have been found on nearly all the sea islands and adjacent mainland areas from Cape Fear, North Carolina, to Saint Augustine, Florida, in the Manatee River section of Florida's Gulf Coast, and in the vicinity of Copano Bay north of Corpus Christi, Texas (Huson 1953).

The vast majority of tabby structures were located on the southern Atlantic coast. This distribution reflects diffusion from two primary centers or hearths: one at Saint Augustine, Florida, and the other at Beaufort, South Carolina. These centers represented the core areas for two separate traditions in tabby building.



Selected extant tabby structures in the Southeastern United States

Saint Augustine and the Spanish Tradition

The First Spanish Period

Early Phase (1580–1701)

The antiquity of tabby in Spanish Florida is documented through Spanish records and archaeological evidence. The earliest references to tabby-like material are found in letters to the Spanish crown dated 1580, which described its use in roof slabs at Santa Elena (Port Royal Island, South Carolina) and Saint Augustine (Sanchez de Mercado 1580; Marques 1580). Evidence of seventeenth-century tabby has been derived from archaeological excavations.

Such data establish tabby floor construction in Saint Augustine by 1675 and wall construction possibly by 1680. Despite early references to tabby in the sixteenth and seventeenth centuries, little use was made of the material until after the British siege of Saint Augustine in 1702. In fact, though under constant threat of fire and storm, Saint Augustine was described in most early accounts as a city built entirely of wood and thatch. The introduction of sturdier, less combustible, structural materials occurred relatively late at Spanish Saint Augustine. The two most important materials, tabby and coquina, had similar developmental histories.

The year 1580 was significant on two accounts: first for the earliest reference to tabby roof slabs and second for the discovery of shellstone, or coquina, on nearby Anastasia Island (Marques 1583). Not much use was made of either material until the late seventeenth century, when both tabby and coquina were employed in the construction of the Castillo de San Marcos (1672–98) and for a limited amount of housing. Historical parallels continue through the eighteenth century, which was marked by the popular use of the two materials for house construction between 1702 and 1763 and by a general cessation of building activity following the British occupation of Saint Augustine in 1764.

The First Spanish Period Late Phase (1702–63)

As the British siege of 1702 ended, only twenty houses, the coquina Castillo de San Marcos, one church, and the hospital were left standing. The years following the British attack were spent in rebuilding the city. Between 1703 and 1763 over one hundred houses and a score of public buildings were built of coquina, while an even greater number of new houses were constructed of tabby or tabby in combination with wood (Elixio de la Puente 1763). Elixio de la Puente reports some 182 tabby houses in the city in 1764.

By John Bartram's account, Saint Augustine's poorer residents constructed tabby houses (Bartram 1766). It is likely that coquina was a more expensive building material, because of both the costs of quarrying and transport to Saint Augustine and the limited supply of stone on Anastasia Island. For those unable to afford coquina, tabby was an acceptable alternative. Outwardly stone and tabby presented similar appearances, distinguishable more by architectural style and quality of construction than by material (Ordinance no. 134, 1573). More than one observer misrepresented the city's tabby housing and declared that all the houses were built of stone (Stork 1765; Romans 1775). This mistake, was, of course, understandable, first because good tabby strongly resembled shellstone and was used for similar purposes and second because the practice of stuccoing effectively concealed both stone and tabby.

The hypothesized lower cost of tabby and its resemblance to stone are plausible explanations for the boom in tabby housing during the 1703–64 period. A necessary prerequisite for the material's popularity, however, was the introduction of relatively simple techniques for constructing tabby walls. Two separate methods of wall construction were used in this period; one, layered construction, which employed movable forms, and two, *ostion y postes*—a post-and-beam construction with masonry curtain walls (Steinbach 1969). Neither technique was specifically developed for tabby. The first and probably the most common mode of construction was traditionally associated with *pisé* and *tapia*, whereas the second was used in a variation of post-and-pan construction (Manucy 1962). The building methods may have been applied initially to tabby construction between 1680 and 1710. The success of experiments in this period would seem to be a necessary precondition for the large-scale program of tabby building after the siege. It was extensively used in house walls in the so-called first Spanish period and for flat slab roofs, floors, partitions, and stairways.

The British Period (1764–83)

As part of the settlement of the Seven Years War, in 1763 the British were given title to the Spanish territories of Florida. Nearly the entire population (some 3,103 persons) left Florida for Havana (Cuba) and Campeche (New Spain) between April 1763 and January 1764. The British displacement of the Spanish in Saint Augustine brought about significant change on the character of the city's housing. Almost half of the city's 342 houses, mostly those of wood or tabby construction, were destroyed in the first year of occupation (Bartram 1766). The remaining houses were variously altered. Modifications consisted largely of repairs, alterations, and additions. Finally new houses were constructed. Most were timber frame, sided with clapboard and roofed with shingles, a design distinctly different from that of existing Spanish houses.

The Second Spanish Period (1784–1821)

British rule continued until the 1780s. In 1783, with the signing of the Treaty of Paris, the Florida territories were returned to Spain. Rocque's housing survey taken soon after Spain's reentry into Florida shows no new tabby housing for the 1764–88 period. Patterns established by the British were continued with the Spanish reoccupation. New houses were British-style timber frame or stone. The few tabby houses in the city were vestiges of the 1702–63 Spanish period. Only two new uses of tabby were reported for the 1784–1821 period; they were for floor construction and street paving.

The second Spanish period was notable for the near absence of traditional Spanish construction. The Spanish were a numerical minority in Saint Augustine. Of the estimated one thousand persons in the city, fewer than a hundred were Spaniards, and most of these were either natives of Florida or Canary Islanders. The majority of residents were Minorcan, Greek, Italian, British, or African ancestry (Manucy 1962). Houses left by the British more than met the needs of the small population, so new housing construction was limited.

The American Period (1822–70)

In 1821 the Florida territories were transferred to the United States. Most Spanish citizenry left Saint Augustine; new residents replaced them. American immigrants took over and modernized existing houses as well as constructed new housing. Alterations of Spanish stone housing included, among other things, the destruction of second-story tabby floors and tabby slab roofs (Williams 1837). Most new houses after 1821 were timber frame, though a few were constructed of stone or of a timber and stone combination. In 1837 half of the three hundred houses in Saint Augustine were of wood construction and the other half of stone. By mid century practically all preexisting tabby construction had disappeared. Most slab roofs had been removed. American interest in tabby was limited. Tabby floors were constructed in the middle and late nineteenth century but only to replace worn-out tabby floors in Spanish and British-built housing.

Saint Augustine—A Center for Tabby Building (1580–1870)

The demise of floor construction in the late nineteenth century signaled the end of the era of tabby building in Saint Augustine. From 1580 to 1870 the continuity of building tradition had been maintained, albeit unevenly, by the Spanish in the 1580–1763 and 1784–1821 periods, the British between 1764 and 1783, and the Americans from 1821 to 1870. Whereas use of the material and the number of structures varied considerably during the three-hundred-year period, the geographical distribution of Spanish-built tabby and subsequent British and Ameri-

can construction was curiously restricted. Though roof slabs and oyster-shell mortars are reported at Santa Elena, Spanish tabby was for all practical purposes confined to Saint Augustine settlement. In other Florida communities, wood and wattle-and-daub were the dominant construction materials for housing and church buildings and stone, wood, ceramic, and sun-dried brick for military fortifications (Boyd et al. 1951). Tabby of Spanish origin at old Copano on the south Texas coast in 1785 may well be linked to this center, and if so, would represent a distant outlier of the Saint Augustine core.

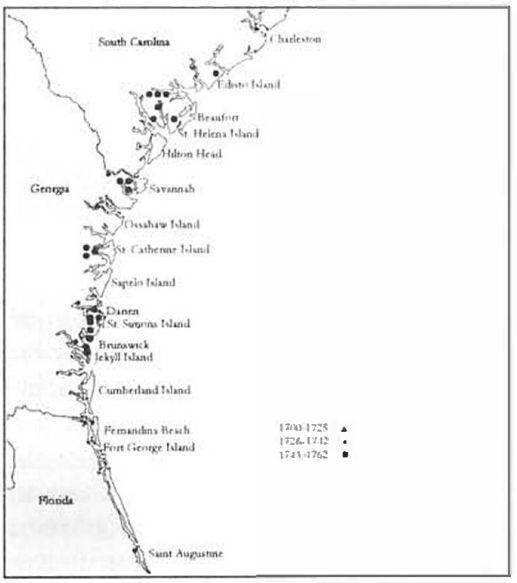
Beaufort and the British Tradition

British-built tabby arising out of Beaufort, South Carolina, had a quite different history and distribution from that of Spanish origin. First, two diffusion hearths operated in the British realm. Second, the development of the British tradition took place after that of the Spanish. Finally, the distribution of British tabby was far less restricted than that of its Spanish counterpart. Beaufort, South Carolina, was both the primary center for British tabby and the location of the earliest British tabby in the southeastern United States. It was here that the British tradition first developed, and from this hearth tabby eventually spread throughout the sea island district. Few details relating to the origin of the building tradition are available, but the requisite skills for tabby construction probably were introduced from Spanish Florida to the South Carolina coastal region about 1700. It is doubtful that there is any direct link between its use at Santa Elena and its appearance in Beaufort some 120 years later. English builders may have acquired their knowledge of tabby directly from observation and participation of the building projects in Saint Augustine or, perhaps indirectly, through a captive Spanish soldier or slave familiar with tabby building.

Tabby in the Beaufort Vicinity (1703–25)

The use of shuttering, or temporary wooden forms, was relatively unknown in British building at the beginning of the eighteenth century. Cob, possibly tabby's closest English relative, did not require shuttering in its construction (Papworth 1818). *Pisé*, or rammed earth construction, which is similar to tabby in method of construction, was not introduced into England until the very end of the eighteenth century (Neubauer 1950). The building material, on the other hand, resembled concrete, with which the English were familiar from Roman construction in Britain.

The earliest confirmed use of shuttering by British builders was for the construction of tabby foundations of large residences in Beaufort. Tabby had definite advantages for this type of construction. Brick, the preferred material, was in short supply, for it had to be imported to the region. Tabby offered an inexpensive and suitable substitute.



Tabby of British origin from 1700 to 1762.

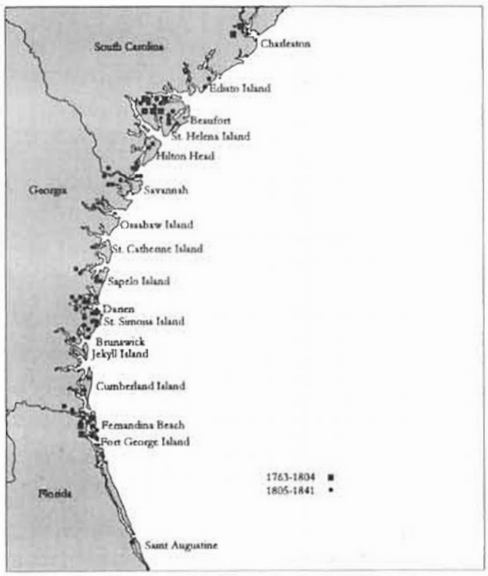
Tabby in the Beaufort Vicinity (1726–42)

By the second quarter of the eighteenth century, the shuttering technique was employed in virtually all tabby construction, and the use of the material extended to entire buildings. Examples include Fort Prince Frederick, possibly the Chapel of Ease (Saint Helena Island), and the main house at Retreat Plantation. Owing to its low cost with respect to component materials and its inherent sturdy properties, tabby was an ideal material for military construction, especially coastal fortifications. Fort Prince Frederick was constructed between 1731 and 1734 (Ivers 1970). Its tabby successor, Fort Lyttelton, was begun in 1758. Besides its use in fortifications, tabby was also used in a church and a plantation near Beaufort. The Chapel of Ease to Saint Helena Church in Beaufort was built between 1726 and 1734. The two-story tabby house at Retreat Plantation may have been the oldest all-tabby residence and the earliest example of two-story construction in the area.

Tabby on the Georgia Coast (1736–42)

The period from 1726 to 1742 was also marked by the growth of a second center of tabby construction north of Saint Augustine. This secondary hearth appears to have been located on Saint Simons Island, twelve miles from Brunswick, Georgia. The island, which contains the remnants of Oglethorpe's fortified settlement, Frederica, exhibits examples of tabby that have been dated to 1736. The fort at Frederica may be counted as the largest assemblage of tabby structures (Fairbanks 1956). The techniques for tabby construction might have been acquired by Oglethorpe and his Georgia settlers during documented stops at Port Royal in 1732 and 1735. This would directly link the Beaufort center of tabby to the emerging Saint Simons Island center.

Technical skills for tabby construction were taken to other sections of the Georgia coast during the years Frederica was under construction. The diffusion resulted from the movements of various officers in Oglethorpe's command. For example, William Horton, a captain under Oglethorpe, was instructed to establish a military outpost on nearby Jekyll Island in 1736. In the course of his assignment, Horton, the first permanent resident of the island, is said to have constructed two tabby buildings of considerable proportions: a two-story house (1738) and a large tabby brewery. In 1738 Mark Carr, another of Oglethorpe's officers, set up a military outpost and plantation on the mainland, where he used tabby in the construction of several outbuildings. Lt. Noble Jones, three years later, constructed a tabby residence, Wormsloe, on the Isle of Hope, ten miles southeast of Savannah.



Tabby of British and American origin from 1763 to 1841.

Tabby in South Carolina and Georgia (1742–62)

By 1742 tabby and its related construction techniques were well established in two locales within the British provinces. Highlighting the period was the diversity in applications (i.e., forts, hornwork,

houses, foundations, chimneys, outbuildings, walls, burial vaults, and walkways).

Decline of Tabby in Georgia (1763–1804)

During the last three-and-a-half decades of the eighteenth century, tabby maintained its popularity in and around Beaufort, but its use was discontinued on the Georgia coast. The latter was likely a result of the abandonment of the fort and settlement at Frederica. In 1748 peace was made with Spain in the Treaty of Aix-la-Chapelle, and the regiment of British soldiers at the fort disbanded the following year. With the regiment gone, the town of Frederica began to lose population. In 1758 a ruinous fire destroyed most of its buildings, and by 1763 the town was completely abandoned (Cate 1956). With the demise of the center of diffusion, the numbers of tabby structures declined drastically. In fact 1762 was the last year that tabby was used in any significant construction on the Georgia coast until its reintroduction in the early nineteenth century.

The Revival of Tabby in Georgia and Its Expanded Distribution in South Carolina and Florida (1805–42)

At the beginning of the century tabby was a viable building mode in and around Beaufort, South Carolina. In the next four decades, the pattern of tabby distribution underwent radical change. Tabby was reintroduced to Georgia, and its use greatly expanded in South Carolina and Florida.

Thomas Spalding, who in 1805 began construction of an all-tabby house on Sapelo Island, ten miles northeast of Darien, Georgia, initiated the revival of tabby in Georgia. The house was completed about 1812 and so marked the beginning of the nineteenth-century revival. Spalding followed the construction of the tabby residence on the island with the construction of several tabby outbuildings and a tabby sugar mill and on the mainland with a plantation house. Once these buildings had been constructed, the building technique began to spread to neighboring plantations and to the nearby town of Darien. Spalding provided impetus to the diffusion through local promotion and published writings (Spalding 1830). By 1842 a number of tabby structures had been build on coastal Georgia plantations and in towns from Darien to Saint Marys.

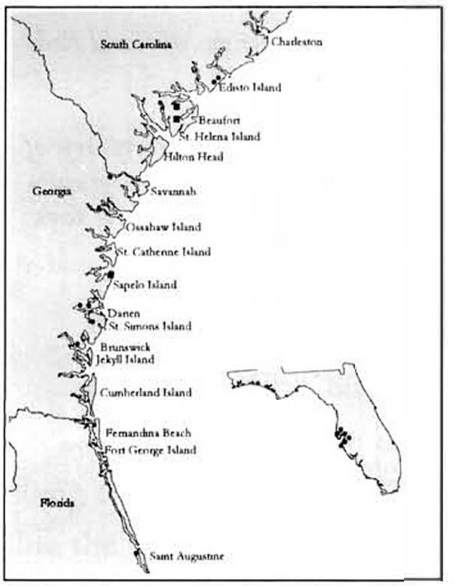
Concurrent with tabby's renewed popularity in Georgia was its diffusion along the South Carolina and Florida coasts. The spread of tabby largely coincided with establishment or expansion of plantations on the islands and adjacent areas of South Carolina and Florida. In view of the sheer number of tabby structures, the years from 1805 to 1842 could be reasonably termed "the plantation era" in the history of tabby construction. This does not negate other recorded uses of tabby for military establishments and public works.

The Decline of Tabby Construction on the Sea Islands and Its Spread to the Florida Gulf Coasts (1842–60)

By 1842 tabby was well represented in the coastal zone, extending from Saint Johns Island to Jacksonville, Florida. In the next sixteen years, notably fewer tabby buildings were constructed within this distribution area. The period is instead marked by the introduction of tabby to the Manatee River section of Florida's west coast. The close of the second Seminole War in 1842 opened Manatee country for settlement. In 1845 construction was begun on the Braden Castle, an all-tabby fortified residence located at the confluence of the Manatee and Braden rivers. Other tabby buildings along the Manatee River included an assemblage of structures at Gamble Plantation and a single remnant at Shaws Point. The outstanding feature of the Gamble Plantation was the extensive use of tabby brick.

The Civil War and the End of Tabby Construction (1861–1920)

The onset of the Civil War marked the end the plantation era and of traditional tabby building. Only about a dozen



Tabby of American origin from 1842 to 1920.

tabby structures postdate the Civil War; half of these date between 1865 and 1875. These include a three-story tenement for freedmen in Savannah and several tabby buildings at Penn School on Saint Helena Island. The latter usage was especially well documented. Other than these structures, tabby's use was relegated to foundations, chimney bases, and an occasional barn.

The end of tabby building was the result of three factors: first, the general disruption of building activity during the war; second, the breakdown of the plantation system; and third, the development of concrete block and inexpensive commercial cements. The last date for new tabby construction was in the 1920s. Tabby in various states of repair and disrepair still remains on the cultural landscape. The structures are certain reminders that tabby once offered a viable alternative to wood, brick, and stone construction in the coastal sections of the southern United States.

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Tabby Resources in Georgia

Michael W. Miller

Tabby resources can be found along the entire length of the approximately one-hundred-mile-long Georgia coast extending from Savannah at the north to Cumberland Island at the south. These fragile resources lie exclusively along the inland waterways, marshes, and numerous barrier islands that line the Georgia coast. Most, if not all, of Georgia's tabby resources are located within the state's six coastal counties of Chatham, Bryan, Liberty, McIntosh, Glynn, and Camden. Although historic resource surveys have been conducted for all six counties at some point in the past, only two counties have been extensively surveyed employing the most current survey methodology of the Georgia State Historic Preservation Office. In McIntosh and Glynn, the two counties that have had the most up-to-date surveys, over thirty sites have been identified that have tabby buildings, structures, or ruins.

A large percentage of tabby resources are located on the eight major barrier islands on the coast. These islands contain marshlands, inlets, and high grounds ranging from ten to fifty feet above sea level. The islands vary in size from Cumberland Island, which is one of the largest (eighteen miles long), to smaller Wolf Island, which is only about four miles long. Most of the islands vary from one-half mile to three miles wide and were farmed as early as the eighteenth century.

When contemplating the preservation of tabby, one must consider the climate along the Georgia coast. Although the sea breezes keep temperatures during July and August in the eighties and low nineties, the islands have high humidity with over fifty-three inches of rain annually. Even with the warm summer climate, temperatures are susceptible to go below freezing at least three months of the year. The Georgia coast averages about one hurricane every ten years, usually between August and October, although the many smaller storms are just as great a threat as the hurricanes. Tides reach a height of seven feet on average.

The islands and the coastal mainlands have a variety of ecosystems. They vary from beaches and sand dunes to heavily wooded interiors with ponds and creeks

to marshlands and tidal sounds. Most, if not all, tabby resources are located on the marshlands sides of the islands rather than facing the open Atlantic. Many of the tabby resources reside adjacent to or within maritime live oak forest or dense underbrush. Obviously, with the hot humid climate, many sites have been or are susceptible to being overtaken by the heavy undergrowth and vegetation.

When compared to other states, Georgia's barrier or sea islands have remained remarkably undeveloped and maintain much of their natural state. Only Jekyll, Saint Simons, and Tybee have experienced substantial development over the last hundred years. These three islands are also the only ones accessible by automobile. The remaining islands of Ossabaw, Saint Catherines, Sapelo, Wassaw, Wolf, and Cumberland are somewhat protected because of their federal or state ownership or designations as National Wildlife Refuges, Heritage Preserves, or National Seashores, and have limited access. The ownership and federal designations of the islands should continue to help protect the tabby resources from development pressures on the majority of these islands.

I will now give a quick visual survey of some of the tabby resources here in Georgia. It will follow the three time periods of tabby construction in the state:

- The Colonial period, which dates from the establishment of Frederica in the 1730s to the abandonment of the fort in the 1750s.

- The Tabby Revival period prompted by Thomas Spalding. This period dates from around 1805 to the 1840s. Georgia has more resources from this period by far than from any other time period.

- And then last, a short twenty-year period from about 1890 to 1910 when portland cement was used to construct tabby-like structures.

Colonial Period (1730s to 1750s)

Fort Frederica
Saint Simons Island, Glynn County

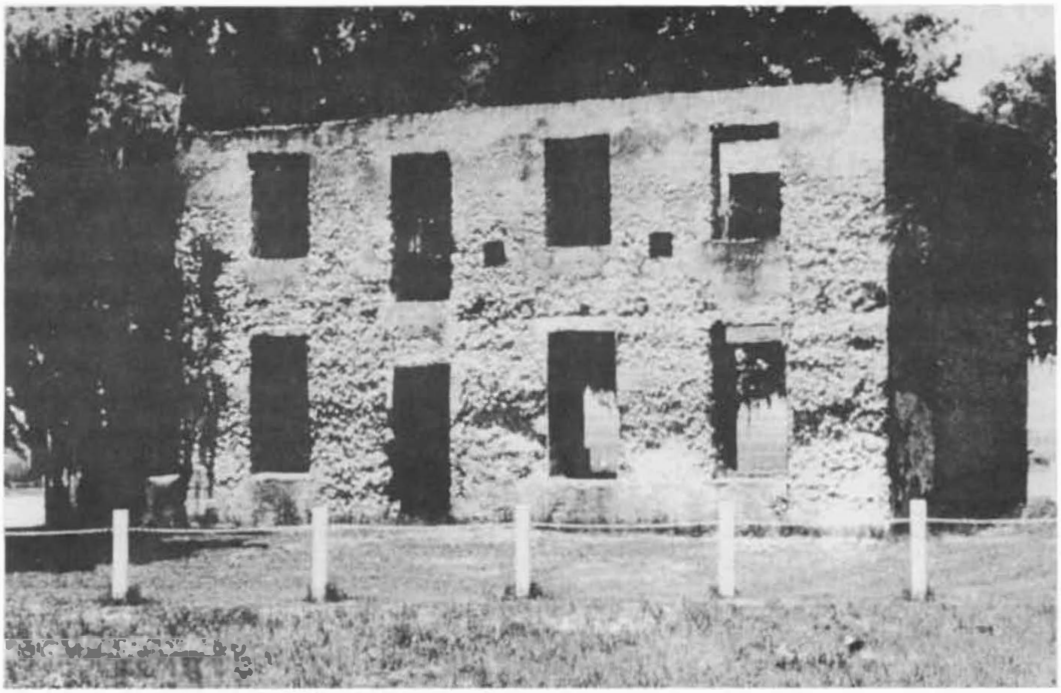
Any discussion of colonial tabby must start at Fort Frederica. The tabby structures here are among the oldest tabby ruins in the state and date to the 1730s. The town began as a British military fort, but fewer than thirty years later, it had been abandoned and was absorbed into the surrounding densely vegetated forest. Since the site's "rediscovery" within the last hundred years, it has had over forty-five archaeological excavations. It is currently a National Historic Monument and is managed by the National Park Service. Only scattered fragments remain of the original structures.

Only two above-ground ruins remain, a portion of the fort itself and a segment of the barracks building. Original tabby can be seen at the fort ruin, but substantial reconstructive work has been done on the fort structure. The two-story barracks tower is quite impressive, still giving definition to the original barracks building. As observers can see, portions of the tabby floors and foundations are all that remain of the residential structures. Typical residences were built of tabby, wood, and brick in the Georgian style of architecture.

Horton-DuBignon House
Jekyll Island, Glynn County

At the intersection of Riverview Drive and Horton Road, just about a mile from where we sit, stand the remains of the Horton-DuBignon House. Built by Maj. William Horton in 1738, at about the same time General Oglethorpe was constructing Fort Frederica, this is one of the oldest intact tabby structures in Georgia.

The structure that remains today is a two-story tabby ruin, forty-one feet long, eighteen feet wide, and eighteen feet high.



The Horton-DuBignon House on Jekyll Island (circa 1738) is one of the oldest intact tabby structures in Georgia.

There is one standing chimney on the west facade. The existing ruin is made up of three separate tabby constructions. Portions of tabby and the existing stucco date from the 1899 "restoration" of the structure by the Jekyll Island Club. It may have been during this period that steel rods were added for bracing. The second tabby pour, the age of which has not been determined, is evident along portions of the second-floor windows. The remaining portion, which is the majority of historic tabby, is identical in texture and consistency to that of the nearby ruins of the Horton Brewery, which date to the 1730s. A conjectural drawing done in a 1960s restoration plan depicts what the house may have looked like.

Several hundred feet southeast of the Horton House lie the ruins of Georgia's first brewery, the Horton Brewery. As can be seen by comparing these 1960s photographs to the current conditions of the brewery ruins, much deterioration and erosion have occurred within these short thirty years. In fact, most of the brewery ruin has fallen into DuBignon Creek. Adjacent to the brewery ruins is the DuBignon burial ground with several nineteenth-century tombs.

Wormsloe
Chatham County

The tabby ruins at Wormsloe, just south of Savannah, mark the location of the fortified house of Noble Jones, another contemporary of General Oglethorpe. It was constructed around 1739. Located inside a fortified wall, the house was thirty-two by twenty-four feet in dimension. Jones built the house in the Georgian style common to the houses of Frederica. It was at least one-and-a-half stories high.

The tabby portion of the structure was eight feet high (the same as the outer wall), while the remainder probably consisted of frame construction. The tabby walls were smoothed with plaster and whitewashed. Today the ruin is a state historic site and borders the 1828 Jones plantation home, still owned by the Jones family. The state historic site interprets the fortified tabby house to the general public. Proper preservation and maintenance of the existing tabby walls are a major concern of the Department of Natural Resources, which manages the site.

Tabby Revival Period (1805 to 1840s)

With the abandonment of Fort Frederica in the 1750s, tabby construction ceased in Georgia until the early nineteenth century, when in 1805 Thomas Spalding, a Sapelo Island plantation owner, began constructing his tabby house there. Spalding's writings and enthusiastic support for tabby construction spurred a tabby revival all along the Georgia coast. Only a few tabby walls remained of Spalding's house on Sapelo in 1912 when the house was reconstructed and rebuilt. Today the house is better known as the R. J. Reynolds Mansion, and no tabby remains visible in any part of the house. However, various tabby ruins scattered about the Sapelo landscape include a sugar mill ruin, barns, and slave cabins. One of the best-preserved tabby sites on Sapelo is that of Chocolate Plantation.

Chocolate Plantation on Sapelo Island in McIntosh County is believed to have been built sometime between 1812 and 1820. The site consits of over fifteen tabby structures, including the main house, individual slave cabins (above), storage buildings, an infirmary, and stables.

Chocolate Plantation
Sapelo Island, McIntosh County

The ruins of Chocolate Plantation on Sapelo Island and its associated outbuildings are most impressive. While the barn is the only main intact building with a roof, the other structures are remarkable because of their collection as a whole. The site consists of over fifteen tabby structures, including the main house, individual slave cabins, storage buildings, an infirmary, stables, and many other buildings the use of which is still in question.

Chocolate Plantation is believed to have been built sometime between 1812 and 1820 by Edward Swarbreck, a business partner of Thomas Spalding. While Sapelo Island is owned by the state of Georgia, a nonprofit group, the Friends of Sapelo, has been very active in attempts to develop a preservation strategy for this site and to keep vegetation off the structures. Immediate structural stabilization of many of the walls is needed before much of this site is lost.

Ashantilly Plantation
Darien, McIntosh County

The Ashantilly Plantation house is a two-story central block flanked by identical one-story wings. The foundation and exterior walls are tabby with stucco finishing. The house is thought to have been built between 1812 and 1815 as the mainland home of Thomas Spalding. Sometime after the death in 1887 of Spalding's son Charles, the house deteriorated into a ruinous state and was rebuilt. The house was documented by a Historic American Building Survey team in 1936, just a year prior to a fire that destroyed the upper floor.

The house has since been in the process of restoration, but unfortunately as of 1996 was determined to be ineligible for the National Register of Historic Places due to the many alterations it has sustained

over the years. It is presently used by the Ashantilly Center, a local nonprofit group that promotes historic preservation, crafts, skills training, and environmental training.

Of the resources remaining from the Tabby Revival period between 1805 and 1840, most are associated with rice and cotton plantations. Almost all are in a ruinous state but represent a full range of building types and uses: plantation houses, plantation slave houses, cotton barns, corn cribs, plantation hospitals, and chapels.

Dungeness Mansion
Cumberland Island, Camden County

One such island plantation tabby house was the Greene home on Cumberland Island. Built in 1803 by the widow of Gen. Nathanael Greene, a Georgia Revolutionary War hero, this elegant four-story tabby house was better known as Dungeness. The house was burned during the Civil War and remained in ruins until the house and most of Cumberland Island were purchased by Thomas Carnegie, brother of Pittsburgh steel baron Andrew Carnegie, in 1881. At that time the Dungeness tabby site gave rise to an even more eclectic Victorian residence carrying the same name. The Victorian Dungeness itself burned in 1959 and remains in ruins today. Efforts are underway to stabilize the existing ruins.

Adjacent to Dungeness Mansion is the Greene-Miller tabby house, which dates back to the early 1800s and may have served as the gardener's house. It has undergone many alterations and as recently as last year underwent restoration to repair the exterior stucco finish. Fellow symposium participant Lauren Sickels-Taves will be discussing this building and the tabby repair in more detail later. Additional tabby structures dot Cumberland Island, including numerous Carnegie mansions and tabby ruins of other structures.

Tabby has been used in cemeteries throughout coastal Georgia. It was primarily used for retaining walls, such as the one at the Greene-Miller cemetery. Across the coast there are many tabby cemetery walls that are in need of repair.

Cannon's Point
Saint Simons Island, Glynn County

Situated only a few feet from the Hampton River at the northern end of Saint Simons Island, the plantation house at Cannon's Point was once surrounded by olive groves, date palms, and orange and lemon trees. Built in 1804 by Scottish plantation owner John Couper, the home was constructed of tabby at the basement and first floor and wood at the second floor.

The entire house was surrounded by a wide veranda with two sets of grand steps also constructed of tabby. As you will see from our tour tomorrow, the tabby has had numerous repairs made to it—some in a not-so-preservation-sensitive manner. Not far from the main house is a small potato barn that has been rehabilitated for an artist's studio.

Pink Chapel
Saint Simons Island, Glynn County

At the northern end of Saint Simons Island, on the grounds of the former West Point Plantation, is the Pink Chapel, thought to have been constructed originally in 1838 by Col. William Hazzard. Local residents indicate that a developer inappropriately repaired or rebuilt the chapel in the 1970s and that what remains is not the original tabby chapel. The chapel is privately owned. Adjacent to the chapel are former slave cabins that have also been significantly altered.

Hampton Plantation
Saint Simons Island, Glynn County

The various tabby walls and sections found around the site of the former Hampton Plantation may be more typical of the condition of most tabby resources. The land which once constituted

Hampton Plantation is now the site of a residential subdivision built during the 1970s.

The site contains ruins of the main house, its kitchen, the garden, the stables, the overseer's house, and numerous slave cabins. The immediate site and ruins of the main house and a few surrounding outbuildings have been incorporated into the yard of a new house. Across the street is a large tabby ruin which is probably the overseer's house. About two hundred feet west of the ruins of the main house are the ruins of a slave settlement, which has been made into a neighborhood park.

Slave Cabins of Hamilton Plantation
Saint Simons Island, Glynn County

Slave cabins on the Gascoigne Bluff section of Hamilton Plantation are also on Saint Simons Island. These two cabins were given to the Cassina Garden Club in 1931 for preservation purposes. One of the cabins has a rear kitchen addition, but otherwise the overall forms of these two buildings remain intact.

Smokehouse
Saint Catherines Island, Liberty County

Other examples of tabby plantation buildings include this tabby smokehouse on Saint Catherines Island.

Slave Cabins
Ossabaw Island, Chatham County

On Ossabaw Island, tabby slave cabins appear to be in remarkably sound condition as seen from these 1974 photos. Today, however, the structures are vacant and need stabilization work.

Other tabby resources besides those associated with cotton or rice plantations include in-town private homes, warehouses, and sugar mills. One fine example of an in-town tabby house is the Owens-Thomas House in downtown Savannah.

These two slave cabins are located on Hamilton Plantation, St. Simons Island in Glynn County. One of the cabins has a rear kitchen, but otherwise the overall forms of these two buildings remain intact.

Editor's Note: The photograph of the cabins, located on what was formerly Hamilton Plantation, St. Simons Island, was mistakenly omitted. The photograph shown on Page 20 is actually a 1970s picture of cabins on Ossabaw Island, Chatham County, Georgia.

Owens-Thomas House
Savannah, Chatham County

The Owens-Thomas House is an individually listed National Historic Landmark (NHL) within Savannah's NHL district. The building faces Oglethorpe Square and was designed by English-trained architect William Jay. The three-story building is constructed of stucco over tabby and brick and was completed in 1819. Tabby is the primary construction material for the lower portion of the building, which contains two kitchens, a laundry, and a wine room. The house is operated as a house museum by the Telfair Museum of Art and is presently undergoing restoration. The house is in excellent condition and has maintained its original historic integrity.

The Strain Building
Darien, McIntosh County

The Strain Building along River Street in Darien is an excellent example of a commercial warehouse structure constructed of tabby. Built in 1813, the building is presently in very poor condition and in desperate need of structural repair. This two-story, front-gabled cotton warehouse is the only remaining commercial building that survived the burning of the town during the Civil War.

This is indeed a unique tabby resource, in that it is one of the few, if not the only, intact tabby commercial structures still standing in Georgia. Severe structural cracks and the fact that the building is vacant present a challenge to preservationists in Darien. Cotton warehouses and shipping wharfs once lined River Street during Darien's boom days as a major cotton and rice port; however, since Darien was burned in 1863, most of its historic buildings date to the late nineteenth or early twentieth centuries.

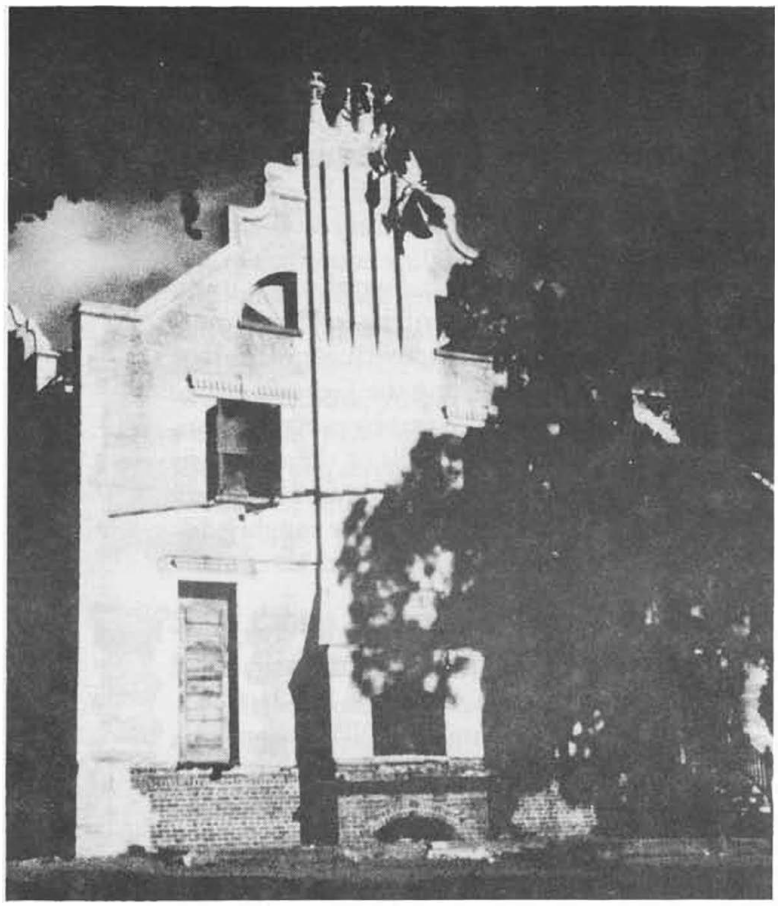
Tabby ruins of other cotton warehouses are readily visible along Scriven and Broad streets. Within the last couple of years the Darien waterfront has been threatened by development from a proposed mixed-use commercial and residential project.

The John Houstoun McIntosh Sugarhouse
Camden County

The McIntosh Sugarhouse, built around 1826, is one of the few remaining remnants of a once-active sugar manufacturing industry along the Georgia coast. It is one of the largest tabby ruins in Georgia. The standing walls of the structure are approximately fourteen feet high and fourteen inches thick. They roughly define a rectangular building with three main rooms and two porches.

The facility was built by John Houstoun McIntosh to process sugarcane grown on his adjacent twelve-hundred-acre New Canaan Plantation. The sugar mill in its operation consisted of three main rooms that are still evident today: the milling room, where the sugar cane was ground into juice; the boiling room, where the juice was poured into shallow kettles and boiled to syrup; and the curing room, where the syrup was put into barrels to cure. For the most part no exterior coating of stucco remains visible on the ruins.

Extensive archaeological investigations by fellow tabby symposium participant Thomas Eubanks occurred at the site in the mid 1980s when construction of the Kings Bay Trident Submarine Base began immediately adjacent to the sugarhouse site. The site is presently owned by Camden County and is open to the general public as a passive recreational park.



Hollybourne Cottage on Jekyll Island was built in 1890. The house is presently vacant and has numerous structural problems.

Twentieth-Century Tabby (1890 to 1910)

There are very few examples of twentieth-century tabby construction. The tabby-like structures that incorporated portland cement together with tabby are indeed few and far between.

Jekyll Island Dairy Barn Silo
Jekyll Island, Glynn County

The Jekyll Island Dairy Silo is the only remaining structure of the Jekyll Island Dairy, which closed at the onset of World War II. Constructed of cement and shell aggregate around 1903, this three-story circular structure remains abandoned.

Hollybourne Cottage
Jekyll Island, Glynn County

Completed by bridge-builder Charles Maurice in 1890, Hollybourne Cottage used a curious combination of bridge-building techniques together with the blend of tabby. The finished house has components of Flemish design and is one of the most interesting cottages at Jekyll. The house is presently vacant and has numerous structural problems.

Summary

Georgia's tabby structures are indeed some of this state's most historically significant resources. I would say that most, if not a majority, of the tabby structures in Georgia are presently being maintained as ruins and structures without roofs and need site-specific stabilization. All sites need short- and long-term solutions for appropriate maintenance and preservation techniques as well as an overall preservation management plan. While you are here at Jekyll and at Saint Simons you will be seeing a number of these unique resources first hand. We thank you for coming to this symposium, and we look forward to working together to preserve these historic resources.

Tabby in South Carolina

A Versatile Building Material

Dan Elswick

The historic use of tabby in South Carolina indicates that it was a versatile building material. This unique composite material of shell, lime, and sand was used in buildings along the coast of South Carolina for over a century.

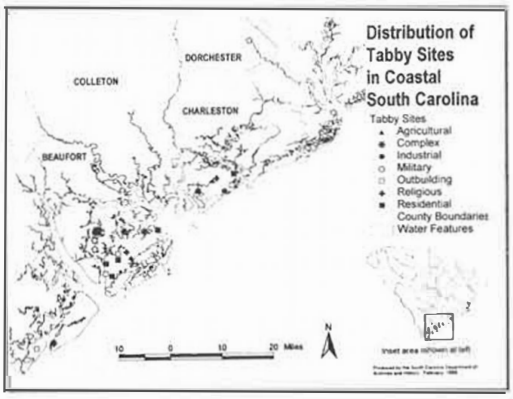
Going back to the time when colonists first reached these shores, we know that they approached a vast uncharted land with many natural resources. Broad streams along the coast cradled the sea islands. Colonists naturally used the materials that they found in this new land for constructing their buildings. Shell was readily available from shell rings, mounds, and middens. Lime was available from burning those same shells, and sand was also plentiful on the sea islands.

One of these early settlers, Paul Grimball, established his residence on Edisto Island in 1686. This site is known as the earliest tabby in South Carolina (date of construction from National Register Nomination). It is interesting that not only are the foundations remaining, but so is a section of wall at one corner.

Military Uses

As a building type, the earliest resources are the military fortifications, such as Fort Frederick on Port Royal Island, built about 1734, and Fort Lyttleton, also on Port Royal Island, built in 1758. Fort Marion, built in 1807, includes a massive semicircular tabby wall that is 175 feet long, 8 feet in depth, and 8 feet in breadth. All of these fortifications were built to protect the water access to Beaufort, a significant port that is the second-oldest city in South Carolina. The tabby walls at Fort Johnson were built about 1759 to protect the Charleston harbor. A map of 1800 shows these fortifications in ruins. This deterioration appears to have been caused by the changing shoreline, already inland of the walls by 1800. The tabby portion of this fort is no longer extant.

The fortifications at Dorchester, up the Ashley River from Charleston, were built between 1757 and 1760. The Ashley River was an aquatic highway in those days and was faster than overland routes for access to inland properties. The remains



Dating from 1787, Tabby Manse in Beaufort, South Carolina, has two-story tabby walls on a raised tabby foundation.

of these fortifications are protected as part of the Old Dorchester State Park, maintained by the South Carolina Department of Parks, Recreation, and Tourism.

The earliest portions of the ground floor wall of the Beaufort Arsenal (1795) are tabby.

Residential Uses

Residential structures represent the largest category of tabby resources in South Carolina. Tabby was used in residential construction, scattered all along the lower coast, from the last quarter of the eighteenth century through the middle of the nineteenth century. A typical original finish of scored stucco created the image of a very sophisticated masonry building.

Some of the residences have full exterior walls of tabby. Dating from 1787, Tabby Manse in Beaufort has two-story tabby walls on a raised tabby foundation. The work on the tabby walls and foundation at the Barnwell-Gough House (1789), also in Beaufort, is the subject of one of our case studies.

The Tombee Plantation House (1790–1800) and the main house at Coffin Point Plantation (c. 1801) represent the use of tabby for only the foundation of the house. They are the focal points of their respective sea island plantations on Saint Helena Island. Town houses like the John-Mark Verdier House (1795) and Marshlands (1814) also have tabby foundations.

Many of our tabby resources, like the example of tabby foundation ruins on Saint Helena Island at Land's End Road, are in ruins. Sites like these are important for the information they may yield in how tabby was used as well as how it was originally constructed.

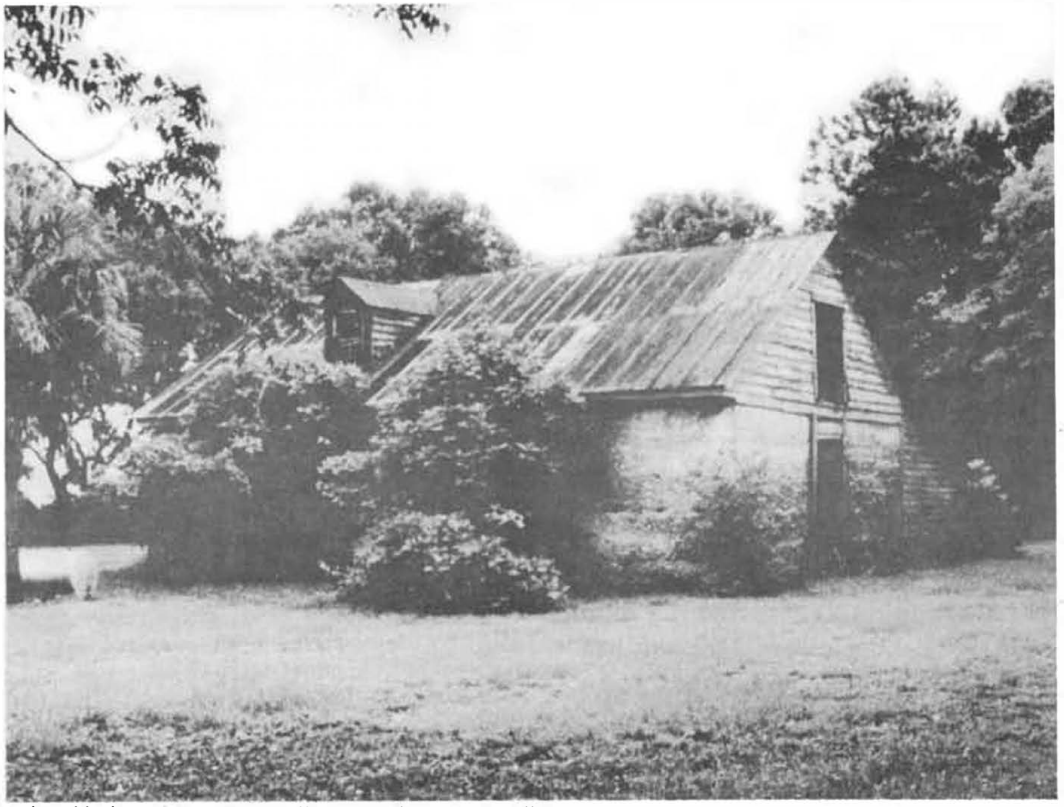
The Isaac Fripp house (c. 1800) is an example of a ruin of a residence that had full-height tabby walls. From sites like this, we are able to understand more about the framing and other construction details of tabby residences. The actual size and profile of wood members that are let into the tabby are often evident once those members have been lost through fire or deterioration.

The three-story Habersham house (1797) in downtown Beaufort may be the tallest tabby residence in South Carolina. The current condition of the tabby is rather fragile, and the building has suffered from the removal of the front and rear tabby walls of the first floor. These long tabby walls of the upper levels are supported by steel columns and beams at the first floor.

Outbuildings

Outbuildings on many of the sea island plantations were built of tabby. A tabby hearth remains from a kitchen outbuilding (c. 1800) at Orange Grove Plantation. It is set very near the plantation cemetery, which is enclosed by a tabby wall.

The slave houses (c. 1805–40) at Haig's Point Plantation on Daufuskie Island were constructed of tabby. The palmetto tree growing at this site is located very close to the tabby wall. While this may not be a problem for this particular property, vegetation often causes tabby to deteriorate. Of more concern would be the vines that wrap the ruins of the outbuildings (c. 1800–50) at Riverside Plan-



The tabby barn (circa 1800) at Frogmore Plantation is still in use.

tation on Saint Helena Island.

Bleak Hall Plantation provides us with some later examples (1840) of outbuildings, like the smokehouse. Other tabby from Bleak Hall includes a large outbuilding foundation and the icehouse. The icehouse has charcoal between the exterior and the interior tabby walls. This charcoal is said to have been included to act as insulation.

The tabby well at the Saint Helenaville archaeological site represents another use of this versatile material for ancillary structures. A similar use in Saint Helenaville is the tabby cistern.

Agricultural Uses

Tabby was also used for agricultural buildings. The large tabby structure at Bleak Hall may have been used for grain storage. A tabby barn (c. 1800) at Frogmore Plantation is still in use. The cotton gin foundation at Sunnyside on Edisto Island in Charleston County is interesting as a postbellum example, dating from about 1870.

Industrial Uses

Tabby structures also had industrial uses. The bread from Hepzibah Jenkins Townsend's tabby ovens (c. 1815) on Edisto was sold in the Charleston market.

Indigo was an important crop in early South Carolina. The ruins of the tabby indigo vats at Burlington Plantation in Beaufort County are stained from the indigo processing.

Use in Religious Buildings

Religion has remained very important to South Carolinians from the days of the early settlers. The Saint Helena Chapel of Ease (c. 1740) was established in the days when travel to Beaufort may have taken most of a day. This early building has tabby walls with brick columns and brick arches over the window openings.

The use of tabby can illustrate the connection from one historic resource to another. Hepzibah Jenkins Townsend built her ovens of tabby and also endowed the building of Edisto Island First Baptist Church (1818). The original section of this church rests on a tabby foundation. The later addition stands on a brick foundation. Even more unique is the early baptismal pool (c. 1818), also built of tabby.

Sams Tabby Complex

The Sams Tabby Complex represents the full range of versatility of tabby as a building material. The site contains a number of buildings that were used in a variety of ways. The Sams family began building the complex about 1790 as the seat of their sea island plantation. The ruins of the main house, which is quite large, show the original core with two large wings creating an unusual rambling plan for the completed house.

Outbuildings include the dairy house and enclosure as well as the kitchen. The large tabby chimney that remains standing was part of the original kitchen. Excavations at the kitchen site have also unearthed the tabby foundations for the walls.

The chapel was an integral part of plantation life. Not only were the walls of the chapel constructed of tabby, but the cemetery was also enclosed by a tabby wall. One could even say that the members of the Sams family lived with tabby from cradle to grave.

Tabby was a versatile building material, giving up nothing to the other materials available at the time (stone, brick, or wood) in its ability to adapt to a variety of uses. It is hoped that this presentation will expand your experience with the variety of structures and buildings built of tabby in South Carolina.

The Saint Helena Chapel of Ease (circa 1740) features tabby walls with brick columns and brick arches over the window openings.

Tabby Resources in Florida

Walter S. Marder

In Florida, the issue of tabby faces two problems right from the start. The first and most important is a lack of interest or understanding. The second is a persistent misidentification of tabby work. The Florida Master Site File lists nine structures in a search for tabby. Only two of them actually are tabby, while the other seven are not. This prompts me to consider retitling this talk "Ta Be or Not Ta Be"! We have the Tabby House in Fernandina Beach, which is actually poured concrete; a tabby church, Flagler's First United Methodist; and a tabby hotel, the 'Cordova,' both in Saint Augustine. Again, both are poured concrete and tabby. In Sarasota there is a pool house claimed to be of tabby brick that has all the appearances of being constructed of 1960s slump block.

Finally, in the March 1997 issue of *Southern Living* magazine is a brand-new "tabby"house in Tampa. [1] Fortunately we have not listed it in our site file yet. The house is of course not tabby at all but more like old-fashioned pebble-dash with oyster shells instead of pebbles thrown on a stucco finish. The owners, though, are said to be very happy with their new tabby house.

The site file also missed some of the most important tabby buildings that we actually do have, specifically the many buildings on the Kingsley Plantation on Fort George Island north of Jacksonville. The Kingsley Plantation has Florida's earliest example of tabby structures. The plantation house is in two parts, the earliest dating, we think, from 1791 when a planter from Philadelphia named McQueen settled on what had been a British plantation on Fort George.

The use of tabby was apparently widespread, by both the Spanish and British communities. There is ample evidence of it in the few remaining historical portions of buildings in Saint Augustine, as well as those buildings that are extant. Literature, too, abounds with reference to tabby as a building material.

Tabby had, of course, been used earlier than 1791 by both the Spanish and the British in Florida. There are several remaining tabby floors in Saint Augustine, notably the Segui–Kirby Smith House, constructed around 1768. That house was built on a parcel that apparently had two earlier tabby houses, both from

The Kingsley Plantation on Fort George Island north of Jacksonville features Florida's earliest examples of tabby. Above is the main house.

the seventeenth century. A recent find in New Smyrna Beach, farther down the coast, also shows evidence of a tabby floor used for a frame-and-wattle dwelling constructed by the English Turnbull colony about 1767 and pushes the tabby "frontier" farther south than it had been heretofore known. Turnbull's colony was peopled primarily with Minorcans, and how and whether they were responsible for the tabby remains to be discovered.

Returning to the Kingsley Plantation, the bulk of the structures—main house, barn, and slave quarters's— may date from around 1802, as built by one John Houstoun McIntosh, who bought the plantation from McQueen; or they may date from 1817 when Zephaniah Kingsley acquired the property; or they may have been built over a period from 1791 through the early part of the nineteenth century. Evidence provided by an archaeological investigation carried out by Henry Baker, an archaeologist with Florida's Bureau of Archaeological Research, in 1967 and Herschel Shepard, architect, in the late 1970s showed that there was a great deal of remodeling and adding to the Kingsley buildings, especially the main house. Its tabby construction consists of tabby bricks used in the basement and tabby floors that run under the basement's lowest construction material, which is coquina. The tabby brick also shows, according to Shepard, two distinct typologies and possibly periods.[2]

The McQueen House part of the plantation complex also contains tabby bricks in its foundations. The barn is in two parts, one of clay brick and the other of the traditional cast tabby. The barn was repaired in 1978 by Shepard using a mix consisting of cement, lime, sand, and oyster shell. The specification called for hand-applying the oyster shell separately from the mortar in order to simulate the horizontal orientation assumed by the shell when originally poured.

Kingsley's slave quarters, some twenty-four in all, are all of the traditional

The ruins of the slave cabins at Kingsley Plantation are in remarkably good condition after almost two hundred years.

cast-in-place construction method with lifts ranging from nine-and-one-half to eleven inches. They have been most recently worked on in a 1996 training course sponsored by the Williamsport Center under the direction of Tom McGrath. With one reconstructed exception all remain roofless, with only the walls standing, and are in remarkably good condition after almost two hundred years, a lively demonstration of tabby's durability.

Another building on the Kingsley Plantation has an even more mysterious history, dating from either the early or middle nineteenth century, depending on whom you believe. The early date would suppose it was constructed in 1798 and later occupied by Manusila Mcgundo, whose name it now bears. This would make it contemporary with the earliest building on the plantation. A later revision of the dating places construction at around 1855. A visitor's guide to the plantation reads that the house was "under construction by Charles R. Thompson for his daughter Sarah Ann when he died in November 1855. The house was never finished or occupied" (site file 8DU399). It is a two-pen structure, now roofless. There is one other tabby building on Fort George Island, a one-room building presumed to have been built in the early 1900s and now in a ruinous state as well.

Just to the northwest of Fort George Island lies Black Hammock Island. In a remote location at Cedar Point is the last known tabby structure, Cedar Point Plantation, probably constructed in the early part of the nineteenth century. It is in two adjoined sections, one of which was two stories, the other one story, each of plastered and scored tabby brick. Nearby are the unexamined remains of another dwelling that may be circa 1795; this would have been the original building on the plantation, constructed by William Fitzpatrick. One two-story-high end wall remains as well as some other wall segments.[3]

At the opposite side of the state in Pensacola, tabby had been employed in the construction of the Panton-Leslie building, a two-story trading post established by that English firm around 1790. Of British origin, it has been destroyed, and the exact extent of tabby's use in the building has not been identified; we only know that it was used as a flooring material.[4]

On Florida's west coast there is an

example of another tabby plantation house in Ellenton, a small village near Bradenton, on the Manatee River. The plantation was constructed between 1844 and 1856 by Robert Gamble, a banker who had moved to Ellenton from Tallahassee. The house is constructed of clay brick, and all of the west wall and portions of other walls are tabby brick, as are the columns. The clay bricks are a type that indicates that they may have been imported to the site from North Florida and, when used up, supplemented by the tabby bricks, which were probably made locally. There are also the remains of a sugar mill, with clay and some tabby brick having been used in its construction, and a cistern which is formed from cast-in-place tabby.

In 1989 the tabby bricks at the top of several of the Gamble Plantation columns were found to be severely deteriorated; the cause was not determined but probably was a result of water getting into the columns via the beam pockets and deteriorating the material or from a previous patch of the beam pockets of high cement content, which proved incompatible. Patching was done at this time with a soft mortar, and the problem has not recurred.

Our final example comes from the Florida Keys, the George Adderly House on Key Vaca near Marathon. It was constructed by Adderly, a farmer from the Bahamas, in 1906. It is a Bahamian-styled single-room dwelling with hipped roof and stuccoed exterior. The house is believed to be tabby, but the exact construction method was not determined when it was recently rehabilitated, an unfortunate omission, as the use of tabby has not yet been identified in the Caribbean basin. This occurrence could possibly indicate that there was an awareness of tabby in the Bahamas.

As with other coastal areas in the South, tabby was a great building material in Florida, where clay for brick was not readily available and where the builder wanted something permanent. Florida was at the edge of our national culture well into the nineteenth century, and much of what was built was highly susceptible to destruction by an unfriendly climate. Tabby fulfilled a need for permanence, speed, and economy not realized again until the advent of concrete block at the turn of the twentieth century. Florida has not properly inventoried its tabby resources and, except for the work done by Shepard at Kingsley, has not dealt with the ramifications of tabby repair or replication, except, unfortunately, in our Tampa example.

Tabby work also needs investigation to determine the mixes used for the various extant structures. This should enable us to see why some tabby failed and why some has lasted with little deterioration. Further, jointing of tabby needs to be explored, particularly cold joints that might be expected to lead to failure. For example, was keying used? These and other questions can lead us to better answers regarding the use of the material, proper repair techniques, and, finally, the potential for discovering tabby walls and floors lurking beneath other materials, waiting to be found.

Notes

1. Louis Joyner, "Tampa Tabby," *Southern Living* 32, no. 3 (March 1997), 138.

2. Henry Baker, "Draft Report of Archaeological Excavations at the Kingsley Plantation State Historic Site Conducted in 1967," Bureau of Archeological Resources, Division of Historical Resources, Florida Department of State, n.d.; Herschel Shepard, *Kingsley Plantation State Historic Site Structural and Site Improvements, Phase I* (Jacksonville: Shepard and Associates, September 4, 1981).

3. Wayne W. Wood, *Jacksonville's Architectural Heritage* (Jacksonville: University of North Florida Press, 1989), 376.

4. Virginia Parks and Judith A. Bense, *Underground Pensacola* (Pensacola: Pensacola Archaeological Society, 1989), 47.

Sugar and Tabby
The McIntosh Sugarhouse, a Special Building on the Georgia Coast

Thomas H. Eubanks

I would like to thank the sponsors and organizers of this symposium for inviting me for this return visit to the Georgia coast. In the fall of 1981 I had the pleasure to conduct intensive archaeological testing at the early nineteenth-century ruins of the John Houstoun McIntosh Sugarhouse, located near the town of Saint Marys, in Camden County. Since that time I have had the opportunity both to direct and to advise archaeological research at sugarhouses that predate and postdate the McIntosh house. For these proceedings, I shall briefly discuss the introduction and history of sugar in the Americas and the technology for producing sugar, molasses, and rum, and then revisit the McIntosh Sugarhouse in order to place it better in the development of the American sugar industry.

Lee Meyer's paper, to be presented tomorrow, is titled "On the Tabby Trail"; perhaps I should have titled mine "On the Sugar Trail." My interest in tabby has come from following the sugar trail as it has progressed through time and location, to understand sugar in its relationship to plantation economy and the people who planted the sugar canes, tended them until harvest, extracted their sweet juice, and transformed that juice into molasses, sugar, and rum. I am also interested in how sugar plantations evolved from their institutionalization during slave times to the changes that accompanied the transition of emancipation to wage-produced sugar.

The sugar trail makes an important stop in Georgia. That stop coincides with Thomas Spalding's efforts to diversify his cotton and rice operations. At the end of the eighteenth and the beginning of the nineteenth centuries, sugar had become a very lucrative crop; and if you, as did Thomas Spalding, had plantation holdings in subtropical areas, sugar could be added to your plantation agenda. Insofar as we know, sugar and tabby first met at Spalding's sugarhouse on Sapelo Island. Because of his relative success with the crop, several of his neighbors also began raising canes and built sugarhouses.

The Sugar Trail

Sugarcane was first domesticated in New Guinea (Mintz 1985:19–23). It began to travel westward as early as 8000

B.C. By A.D. 500, sugarcane was grown in India. As the Moors conquered the Mediterranean Basin in the eighth century, they established sugar plantations in Egypt, Tyre, Crete, and Cyprus and on the Iberian Peninsula. African and other enslaved peoples provided the energy necessary to operate the plantations.

After the Moors were expelled from the Iberian Peninsula, Portugal and Spain continued to produce sugar for the European market. In the mid 1420s, Portugal and Spain expanded sugar production to their Atlantic island colonies in the Azores, Canaries, and Cape Verde islands and on Madeira and São Tomé (Parry et al. 1987:1–2; Mintz 1985:31; Taylor 1978:13). Bonds between European commercial and technical centers and these Atlantic islands were quickly established.

By 1640 Portugal was exporting raw sugar to England, Italy, and Germany (Taylor 1978:14). Bristol, London, Bordeaux, and Amsterdam soon developed into major importers of raw sugar, and by the mid fifteenth century, they had established their own refineries. They also began to improve the equipment used to produce sugar at the plantation factories as well as finance plantation expansions and upgrades of technology.

The European demand for sugar propelled a rapid expansion of sugar cultivation on the Atlantic island colonies, and the island planters became the world's premier sugar makers. By the beginning of the sixteenth century, Portugal, and to a lesser extent Spain, controlled raw sugar production for the European market (Taylor 1978:13–14, Wolf 1982:110–20). It was only natural that the European hunger for sugar would result in the rapid introduction of sugarcane to the tropical and semitropical lands of the New World.

In 1493 on his second voyage to the Americas, Christopher Columbus planted sugarcanes on Hispaniola (Mintz 1985:23, 32; Steward et al. 1956:37). The first American grown and manufactured sugar was exported to Seville in 1516. The cane had been cultivated, cut, milled, and crystallized by enslaved Amerindians and Africans. However, the search for El Dorado, and with it the eventual fall of the Aztec capitol Tenochtitlán in 1521, and the Empire of the Inca in Peru destined a rapid shift from agricultural enterprise to the Spanish exploitation of Mexico's and Peru's remarkable mineral resources (Mintz 1985:35).

When the Portuguese explorer Pedro Alveres Cabral reached Brazil in 1500, a vast new territory of tropical lowlands was opened for plantation agriculture. Within just fifty years, sugar plantations extended from Recife to Salvador along the rich soils of the northeast coast (Wagley 1971:25). The addition of these Brazilian sugar plantations assured Portugal's hold on world sugar production. That grasp would last well into the latter part of the eighteenth century. But the Portuguese-Brazilian hold on sugar production began a steady decline during the mid to late sixteenth century (Taylor 1978:24; Wagley 1971:25). Perhaps the most important factor affecting this downturn involved the expulsion of Dutch and Jewish merchants from Brazil in 1654.

Dutch merchants and seamen had a long and enduring involvement with the Portuguese export market. It should be noted that by 1496, fully one-third of the sugar produced in Portuguese colonies was marketed by the Dutch. However, the Dutch encroached on the Brazilian colony. They established illegal settlements and took advantage of the Sephardic Jewish population in order to trade directly with Brazilian planters, thereby avoiding duties demanded by Portugal (Taylor 1978:22). In 1654 when the Dutch settlers and traders and Jewish merchants finally withdrew, they took with them not only their knowledge of the successful Brazilian cane planting, milling, and boiling practices, but also their access to major European sugar refineries, markets, and sources of new and evolving sugar manufacturing technologies (Parry et al. 1987:61; Wagley 1971:25; Taylor 1978:21–22). This change had the effect of encouraging sugar production in

other tropical and semitropical regions. These events, in fact, established the Caribbean as the hub of sugar production from the late 1650s until the beginning of the twentieth century (Mintz 1991:119).

Through papal decree, and later by treaty, the Americas were divided into Spanish and Portuguese territories with Spain receiving the West Indies. France and Britain did not accept the validity of the treaty and began to establish colonies throughout the West Indies and North America. In the West Indies these French and British colonies were generally founded after 1620 and produced indigo, cotton, rice, and tobacco for export. Sugar was successfully granulated on Barbados in 1642, however, with equipment, financial backing, and tutelage supplied by the Dutch. Even though the Dutch were yet to be expelled from Brazil, circumstances in Brazil necessitated the deliberation of new financial and colonial enterprises.

In the French West Indian colonies, Dutchmen—banished from Brazil—took up residency with established colonists (Stein 1988:6–8; Parry et al. 1987:63–64; Taylor 1978:22). Subsequently sugar production began to increase. Again the Dutch, with their financial backing, equipment, and access to African slaves, assisted in the development of a new and successful sugar industry.

The first sugarcane planted in the British West Indies was brought from Brazil and planted on Barbados in 1637 (Parry et al. 1987:44; Handler and Lange 1978:15–17). The juice was consumed as a sweet tonic. The first British West Indian sugar was produced in the 1640s. Production was accomplished with the aid of Dutch merchants who provided the necessary equipment and technical information and by Sephardic Jews who financed the enterprise (Parry et al. 1987:44; Handler and Lange 1978:15–16).

Large-scale production of sugar in the Spanish Caribbean did not begin until the mid eighteenth century (Steward et al. 1956:47; Moreno Fraginals 1976:15). While the semifeudal oligarchy of Hispaniola, Puerto Rico, and Cuba had continued to grow sugarcane from the time the islands were first colonized, the Spanish farmers were unable to compete effectively with the Brazilian planters.

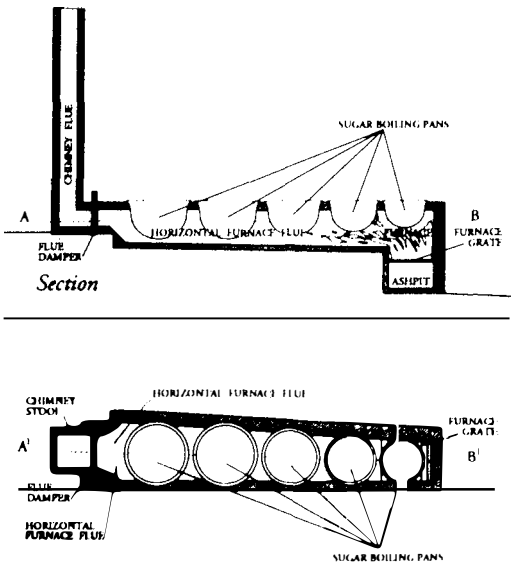
Sugarcane arrived in Louisiana around 1750 (Heitmann 1987:9–10; Sitterson 1953:6–7). The cane was brought from Santo Domingo by Jesuit priests. Because of the sugar makers' lack of proper equipment and knowledge, however, the sugar produced was poor quality. Fleeing the Haitian revolution, French planters and their sugar masters transformed the Louisiana landscape. Large fields of sugarcanes became a fixture in the territory. After the Louisiana Purchase, sugar cultivation became the principal enterprise in southern Louisiana.

During the British occupation of Spanish Florida in 1763, large land grants were offered along the Saint Johns River and in the area of modern New Smyrna Beach (Sitterson 1953:8). One grant in 1767, of 404,858 hectare (100,000 acres), established a sugar plantation and utopian colony of over a thousand English, Greek, Italian, and Minorcan settlers. The utopian colony soon failed as a result of internal strife.

By the end of the eighteenth century, sugar had been demonstrated to be an economically successful crop that led planters in other areas of the southern United States to plant cane. Three major areas of production developed. In Texas sugarcane was planted along the Gulf Coast and bordering the Brazos and Colorado rivers. Louisiana continued to grow cane and by the end of the nineteenth century produced 90 percent of southern sugar (Sitterson 1953:13). The other major areas of production included portions of southern coastal South Carolina, coastal Georgia, and northern Florida. In this region, however, sugar was produced on an intermittent basis and never as the single cash crop of the plantations.

The first report of sugarcane arriving in Georgia is said to have been in

1784 (Coulter 1940:113). He writes that John McQueen brought his Georgian friends cane plants acquired in Jamaica. The next documented report occurs in 1829. Thomas Spalding, of Sapelo Island, began cultivation of one hundred plants in 1805 and started making sugar within a few years (Spalding 1829:55). Spalding also provided cane to other Georgia and South Carolina planters about this time.



Plan

Horizontal rollers, which replaced vertical rollers, processed tougher cane and extracted more juice.

Agriculture and Production Technology for Manufacturing Sugar, Molasses, and Rum

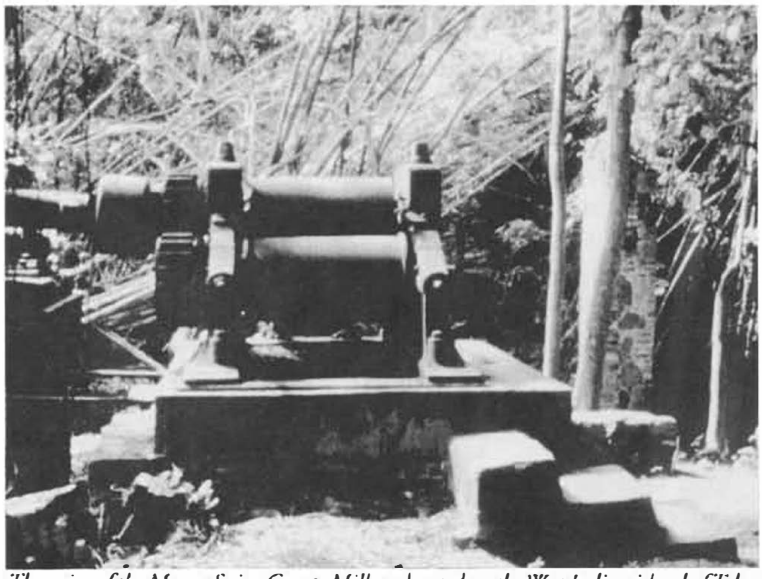
To understand the design and layout of the McIntosh Sugarhouse, we need to comprehend the process and equipment required to make raw sugar. Also, from looking at the state of technology available to McIntosh, we can better realize his thinking regarding the construction of his sugarhouse.

The manufacture of raw sugar from cane juice requires four major steps. First, the cane is crushed or ground by pressing it between the rollers of a sugar mill. This milling process separates the sweet juice from the rind. Second, the juice is clarified to remove dirt and other impurities. Third, the clarified juice is then boiled to evaporate its water content. The evaporation process is continued until the juice becomes a thick syrup. Finally, when the syrup begins to granulate, it is transferred from the boiling kettle to hogsheads or other containers known as sugar molds where the thick syrup will crystallize into raw sugar. Any syrup remaining in the containers after crystallization is then drained off. This syrup (molasses) is sold in that form or reserved for distillation into liquor (rum).

The first recorded modern sugar mills were invented in the mid fifteenth century and were constructed of wood with three vertical rollers through which the canes were forced (Mintz 1985:27–28). Power to turn the vertical rollers was applied through the drive shaft located at the top of the mill. This basic design continued well into the nineteenth century. The first major change from this design involved sheathing the wooden rollers with iron and, by the mid eighteenth century, replacing them altogether with cast-iron head stocks and cast-iron rollers (Sitterson 1953:138).

In the late eighteenth century the standard design for constructing a sugar mill was radically altered. The vertical rollers were replaced by horizontal rollers. This change in design is important for several reasons; not only could more juice be extracted from the cane, but also a harder and tougher variety of cane could be processed. With this design the canes are always crushed twice.

Early animal-powered sugar mills were generally placed at one end of a boiling and curing building known as a sugarhouse or sugar works. The first of these structures may have been little more than a shed over a single boiling kettle with the mill located nearby (Clark 1976:250–56). As knowledge of the process for



The ruins of the Mount Saint George Mill are located on the West Indian island of Tobago.

mill as their energy was transferred to the rollers. This type of arrangement required that the canes be fed between the oxen to reach the mill and that the crushed canes, or bagasse, along with the extracted juice, be taken out the other side, again being carried between the oxen. With the construction of the octagonal mill buildings, the feed paths for the canes, bagasse, and juice could be offset vertically from the tread followed by the oxen. This reduced the problem of getting the canes to and from the mill.

manufacturing raw sugar developed, the boiling and evaporation process and curing operation were carried out inside a two-room sugarhouse (Spalding 1829:60; Sitterson 1953:135–38). The form of the sugarhouse could be either rectangular, L-shaped, or T-shaped. One room of the sugarhouse was dedicated to boiling the cane juice and the other to curing the raw sugar.

As the capital investment in vertical roller mills increased, the mills were housed in their own buildings adjacent to the sugarhouse and generally near the boiling room. At first these mill buildings were often octagonal or circular. This shape is important because such a structure could efficiently house a sugar mill and accommodate the animals as a power source (Crook and O'Grady 1977:322–25; Ford 1937:195). Since the drive shaft of a vertical roller mill extends from the top (or bottom) of the mill, it is necessary for the animals powering the mill to peregrinate around the central axis of the mill.

Large, animal-powered mills frequently employed as many as eight oxen to turn the rollers. The central vertical drive shaft would be affixed with a set of crossed, wooden beams. Each end of the beams would then hold a double yoke. In this way, the oxen would walk around the

As the size of sugar mills increased, the requirement for a greater source of energy to power the mills produced a change in the physical relationship between the mill and the sugarhouse. For example, if a sugar mill is to be powered by wind sails or by a waterwheel, the nexus of the mill and power supply is paramount to the layout of the sugar factory. A sugar mill powered by the wind can be located only at a position that exposes the sails of the wind tower to the prevailing winds. Likewise, a water-powered mill must be situated where a waterwheel can harness power of tides or flowing water. Then the location of the sugarhouse becomes subordinate to the actual site of the mill and its attendant power supply.

The placement of a sugar mill within a wind tower is determined by the configuration of the drive train that links the wind sails to the mill. On sugar plantations that were more prosperous, the planter generally elected to construct two or more windmills. Because winds do not blow constantly, having several windmills working at the same time could insure that enough cane juice was collected

to keep the boiling room operating at full force.

Where flowing river water is available and can be harnessed to power a sugar mill, a waterwheel is frequently installed to turn the mill's rollers. When a waterwheel is employed to power a mill, it becomes necessary to construct a dam to create a reservoir or millpond in order to insure an adequate supply of water for the wheel. The dam must serve to divert water from the reservoir downhill to the wheel. The diverted water must flow through a system of canals and, where necessary, aqueducts and culverts. This system is referred to as a head race. Water leaving the waterwheel flows through a canal until it is returned to the river bed. This canal is called the tail race.

By the late eighteenth century in many sugar producing areas of the world, steam engines were employed to power sugar mills. When new factories were constructed that employed steam power, the major factor involved in siting the factory was a sufficient supply of water to charge the steam boilers. At existing sugar factories, steam power may have been added to improve the efficiency of the milling operation.

The boiling operation on the sugar plantations also went through significant changes. The earliest process used a single kettle. The first change involved adding several kettles, each with its own furnace. Then the kettles were arranged in such a way that a single furnace could be used to heat all the kettles. This arrangement of kettles and fire ditch, or flue, was called a train. The juice was ladled through a series of graduated kettles or pans and became more concentrated as it was moved from the larger to the smaller kettles. The first pan, the largest, was located farthest from the furnace. This system provided the greatest area for evaporation in the first pan and the least area in the last, or strike, pan. The strike pan was located nearest the firebox of the furnace (Sitterson 1953; Moreno Fraginals 1976). As the juice was boiled a scum formed on the surface. This scum, known as wash, was skimmed from the boiling pans. The wash could be discarded or reserved for use in making rum.

During the nineteenth century, trains were enlarged to seven pans, known as a Jamaica train, and then nine pans. The latter expansion was generally associated with a shift from a sugarhouse on the plantation to a large, centrally located sugar factory. These factories were corporately owned by several planters or constructed by an independent entrepreneur (Sitterson 1953; Steward et al. 1956; Wagley 1971; Taylor 1978; Moreno Fraginals 1976). In the late nineteenth century the boiling pans were replaced with vacuum pans of the type used in modern sugar factories constructed in the twentieth century.

If a planter chose to make rum, five steps were required. The molasses had to be fermented, distilled, diluted, sometimes colored, and finally aged (Wray 1848: 390–412; Scard 1913: 61–71). The molasses was placed in a large vat or tank where yeast was added. Wash (skimmings and water) and redunder (residue left over from a previous distillation) were added to the fermentation tank. As the yeast consumed the liquid sugar in the fermentation tank, alcohol and carbonic acid were produced. After fermentation the alcohol-enriched syrup, now also called wash, was transferred to the still.

The wash was brought to a boil in the still (Wray 1848: 390–412; Scard 1913: 61–71). The heat transformed the alcohol into steam, which traveled through a coil known as the worm pipe, which was then cooled by water contained in a worm tub until it condensed. The condensed liquid was rum—100 percent alcohol. The rum could then be diluted and colored through the addition of molasses or burned-sugar products.

The Courland, Mount Saint George, and McIntosh Sugarhouses

I will now discuss the McIntosh Sugarhouse in the context of two other factories that were constructed only a few years earlier. The ruins of the Courland and Mount Saint George sugarhouses are located on the West Indian island of Tobago. I had the opportunity to document them in the early 1990s (Eubanks 1992). I will dwell not on the archaeology of the sites but on their design and layout.

Tobago was colonized late. Not until after 1763 did a nearly stable British occupation of the island occur. Before that time the island passed between various European nations with little success at long-term settlement. After 1763, however, the island was quickly divided into sugar estates, and sugarhouses were constructed. Animals, wind, water, and—somewhat later—steam were used to power the mills.

The Courland Great House/Mill is located near the town of Plymouth on the southwest side of the island of Tobago.

The Courland Estate Complex

The Courland Estate complex contains an extensive set of related buildings, ruins, and archaeological areas that once comprised an estate house, wind-powered sugar mills, and a large sugar factory. The existing original buildings are no longer used for their intended purposes. The estate is located near the modern town of Plymouth, on the southwest side of the island.

- The Estate House. The original estate house exists today as a ruin consisting of brick and cut-coral pillars. This ruin retains sufficient architectural integrity to permit site visitors to understand the nature of living conditions experienced by colonial plantation owners and/or plantation overseers.
- The Existing Great House. The great house, as it is known today, consists of a modified windmill tower with a two-story addition on the southwest side of the tower. The age of the mill tower is unknown because of extensive twentieth-century modifications. Because of its location between the ruins of the estate house and the sugar factory, it is presumed to have been constructed contemporaneously with the factory.
- The Small Wind Tower. The small wind tower's function was to pump water from the Courland River to the estate complex. Examination of the ruins between the existing great house and the sugar factory has linked a brick canal to a small brick water transfer tank, which in turn can be linked to the water tank that rests on the hillside above the sugar factory. Another brick structure was located down the hill (toward the Courland River) from the small wind tower, which may have supported the pipe that once extended from the river to the wind tower.
- The Large Windmill Tower Ruin. The large windmill tower ruin is clearly the same age as the factory and other features associated with the sugar

manufacturing complex. It assists in establishing the inherent difficulty of harnessing and relying upon wind to power a sugar mill and to provide an adequate supply of cane juice to satisfy an efficient factory operation.

• The Sugar Factory. The T-shaped sugar factory represents what may well be the largest extant historic sugar manufacturing and rum distillery ruin in Tobago. The top of the T is the fermentation and rum-aging area of the factory. The stem of the T is the boiling room. The boiling room at Courland is so large that it once could have held two Jamaica trains.

The Sugar Factory Complex at Mount Saint George Estate

The water-powered sugar factory complex at Mount Saint George is also quite extensive. The sugar mill and factory are located on an alluvial terrace along the west bank of the East Hillsborough River 1,750 meters from the mouth of the river on the Atlantic Ocean (near the modern village of Mount Saint George).

•The Dams. Upriver, 1,750 meters from the factory, stands a large dam constructed of coursed stone and mortar. Although the dam was constructed at the best location to impound water storage, it was not the best location for diverting water to the wheel. A small diversion dam was constructed between the large dam and the water wheel. A gate was opened to permit river water to flow into a canal, and in turn the canal carried the river water to the water wheel.

• The Wheel and Mill House. The wheel and mill house are mostly intact. The mill is a horizontal roller mill. When the wheel and mill house were in use there was a roof but no walls.

•The Sugar Factory. The Mount Saint George factory is T-shaped and is divided into three distinct spaces. Two of these spaces are rooms; the third is the worm tub (used in the distillation process). The boiling room forms the base of the T. The top of the T contains the fermentation and aging room for the distillery and the worm tub. Together, the three rooms and tank occupied 501 square meters (5,386 square feet) of floor space.

The Courland and Mount Saint George sugar works represent state-of-the-art facilities for raw sugar manufacturing in the late eighteenth century. They consisted of separate milling buildings and boiling/curing houses. They were sited within the estate lands to take advantage of natural resources. They also conformed to a politically well-guarded agricultural and industrial model of successful sugar plantation operation.

The John Houstoun McIntosh Sugarhouse

At the recommendation of Thomas Spalding, during the first decades of the nineteenth century, many Georgia planters turned to sugar to increase their plantation revenues. This accompanied the end of the War of 1812, which had brought nonimportation and embargo acts that resulted in low United States sugar supplies. Well-established plantations had various options for entering the sugar business. These included selecting the most practical sugar mills for their operations, the most efficient or economical power supplies to turn the mills, and designs for sugarhouses that considered whether they were using animal, wind, water, or steam power (Eubanks 1985: 41–49).

For reasons I have discussed elsewhere (Eubanks 1985), McIntosh selected a horizontal roller mill powered by animals for his sugarhouse (Spalding 1832: 281). This mill was installed at the sugarhouse between 1826 and 1827 (Floyd 1937: 147–48). But the sugarhouse mill was installed in a way that was quite different from the traditional animal-powered operation

(Eubanks 1985, 1992; Floyd 1937:142–60).

McIntosh could have configured his operation like Thomas Spalding's Long Tabby (Crook and O'Grady 1977; Floyd 1937: 106–10), which consisted of an octagonal mill house and a long boiling and curing house. Instead, McIntosh constructed a sugarhouse based on a new design—one building that housed the entire manufacturing process.

The standing walls of the McIntosh Sugarhouse are approximately 4.35 meters (14 feet) high and 35.5 centimeters (14 inches) wide. They define a roughly rectangular structure with three rooms (one room had a second story) and two porches that contain 1965.96 meters (6.450 square feet) of floor space on the ground level. The three rooms are aligned generally east-west, with the porches located on the north and south sides of the central room.

The west room was used as the milling room. It was arranged in such a way that the mill was located at ground level. A floor for a second-story room was supported by an internal wood frame that was not set into the tabby walls. The animal tread, yokes, and mill drive apparatus were located in this second-story room. (See Floyd 1937:152. Note that Floyd shows floor joists inset or attached to the tabby walls for the floor in the second story; they are not present.)

The central room was the clarification and boiling room. A Jamaica train was located along the north wall. The fire door for the furnace was located on the north porch at the east end. Through it bagasse was passed to burn in the fire box. The heated air and smoke then passed through a horizontal flue beneath the boiling pans of the Jamaica train. The heated air then returned through the north wall to the porch at the west end, where a brick chimney had been constructed.

Openings were created in the north wall of the boiling room to service the furnace and connect the flue to the chimney. In order to accommodate the openings, the north wall was constructed differently from all other walls in the building except the south wall of the boiling room. In the lower portion of these two walls, wooden forms, both vertical and horizontal, were left in place as the tabby walls were poured. This created individual tabby blocks that could be knocked out once the tabby hardened.

The east room is the curing room and served to finish the sugar and store it before shipment. The room is divided into three areas, a central hall and two warehouse areas. The elevation of the central area was lower than the north and south areas. Those areas had wooden floors that were supported by beams and floor joists. The beams and joists were set into the tabby walls.

It should be noted that the boiling and curing rooms were constructed together with integral tabby walls. The milling room was constructed as an addition to the boiling and curing rooms.

Why did McIntosh construct a single sugarhouse in which sugarcanes were ground, the juice clarified and boiled, and sugar finished and warehoused? I have elaborated on this issue in my 1985 published report, but I think I can provide some new insight based on my more recent work at other sites.

McIntosh purchased a "high-tech" horizontal roller sugar mill for his factory but attached it to the least efficient means of power, i.e. animal power. But because he enclosed the mill and animals within the overall structure of his sugarhouse, I think his intent was to switch to steam power once sugar production proved itself economical. Another piece of evidence for this consideration is the fact that the second-story floor was not integral to the structure, but self-supporting. A floor constructed in this way could be removed when it was no longer needed for the animals, and removal would not result in damage to the tabby walls.

More evidence to support this hypothesis can be found in the boiling room. As I have stated, the north and south walls were constructed in a special way.

These walls, in their lower portions, are designed to be modified by removing tabby blocks to accommodate the required fire boxes and chimneys necessary to operate Jamaica trains. But only one Jamaica train was installed (along the north wall). I suggest that, again, if sugar proved itself, McIntosh would have added a second train along the south wall.

Together a more powerful milling operation and a second Jamaica train would have significantly added to a successful sugar operation. Unfortunately, many circumstances prevented this from happening: McIntosh's death in 1836 (nine years after the mill was installed), less-than-successful sugar crops, and untried technology.

The John Houstoun McIntosh Sugarhouse ruins still endure, however, to tell us about how sugar was made in the 1820s and 1830s. The ruins have led us to understand issues that were central to plantation economies of that time. Perhaps most important, they provide insight to the intellectual problem-solving McIntosh and his fellow planters perused on the Georgia coast. The McIntosh Sugarhouse is a special building and a very important link to our past where sugar and tabby crossed trails.

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Tabby

A Historical Perspective of an Antebellum Building Material in McIntosh County, Georgia

Buddy Sullivan

The first significant antebellum use of tabby for construction purposes in McIntosh County, Georgia, was by Thomas Spalding of Sapelo Island. Tabby ruins at Chocolate Plantation on the north end of Sapelo, as well as the remains of sugar mills on both Sapelo and the adjacent mainland, attest to the heavy influence Spalding exerted in the development and use of tabby in early nineteenth-century McIntosh County.

Beginning in 1802, Spalding (1774–1851) began acquiring substantial land holdings in McIntosh County. Eventually, he came to own most of Sapelo Island as well as rice lands in the Altamaha delta near Darien, and he developed an agricultural empire rivaled by few of his planter contemporaries in tidewater Georgia. Spalding became widely known for his innovative farming techniques, particularly crop rotation and diversionsification. His experiments in the cultivation of Sea Island cotton, sugarcane, and rice earned him a reputation as one of the region's most advanced planters.[1]

A direct consequence of Spalding's farming methods was his increasing reliance on the use of tabby as the primary building material for his plantation structures, from the lodgings of planter and slave to barns, mills, and other outbuildings. The ruins of the many structures associated with Spalding's plantation activities are scattered all over Sapelo Island as well as on the McIntosh County mainland, including the waterfront of Darien and the Thicket on Pease Point near Darien. Certainly Spalding's advocacy of the use of tabby stems in large measure from his exposure to its concepts at an early age, as he spent his early years in close proximity to the tabby ruins of colonial Fort Frederica on nearby Saint Simons Island.[2]

In 1809 Spalding began constructing his tabby sugar mill on the banks of Barn Creek on the southwest side of Sapelo Island. This structure consisted of an octagonal cane press building and a separate boiling and curing house. These facilities were built to Spalding's own specifications and became the prototypes for similar mill establishments in coastal Georgia. Spalding shared his sugar and tabby expertise with his tidewater contemporaries, and like facilities were constructed by William Carnochan at the Thicket in McIntosh County, Jacob Wood at Potosi near Darien, Dr. Robert Grant at Elizafield, and James Hamilton Couper at Hopeton, the latter two sites being rice and sugar plantations on the Glynn County side of the Altamaha River delta.[3] Spalding had

begun experimenting with the cultivation of sugarcane in 1805, soon after his acquisition of the south end of Sapelo. His considerable architectural skills are clearly demonstrated by his own description, published in 1816, of his sugar works. "The mill house I have erected," Spalding wrote, "is forty-one feet in diameter, of tabby, and octagonal in its form. . . . the danger of fire, the superior durability, and the better appearance of the buildings, should make us prefer either tabby or brick. . . . The outer walls of this building are sixteen feet. . . . Within about seven feet distance from the outer wall, is a circular inner wall, which rises ten feet; and from this wall to the outer one is a strong joint work, which is covered with two-inch Planks for a Tread for the Mules, Horses, or Oxen, that work the Mill."[4]

Spalding's use of tabby is amply documented through his writings. He was a frequent contributor of articles to the *Southern Agriculturist*, the preferred farm journal of the period for tidewater planters.[5] His advocacy of tabby construction of plantation outbuildings, barns, mills, and living quarters for slaves led to its liberal use by numerous coastal planters from South Carolina to northern Florida. "Tabby [is] a mixture," Spalding wrote,

> of shells, lime and sand in equal proportions by measure and not weight, and makes the best and cheapest buildings, where the materials are at hand, I have ever seen; and when rough cast, equals in beauty stone. . . . The drift shells, after the oyster is dead, thrown up along the shores of our rivers, are also used, but the salt should be washed out. . . . In my immediate neighborhood, from following my example, there are more tabby buildings than all of Georgia besides. . . . I generally made my people mix the materials one day and put it into [wooden] boxes the two following, very soft, as the better to amalgamate. 10 Bushels of lime, 10 Bushels of Sand, ten bushels of shells and ten bushels of water make 16 cubic feet of wall. I have made my walls 14 inches thick; below the lower floor 2 feet; for the second story 10 inches beyond that I would not erect Tabby buildings.[6]

The octagonal cane press building and the boiling and curing house are separated by only about twelve feet. The cane press was built in two low stories, with the second floor supported by an inside circular wall of tabby about six feet high. The mill machinery was on the ground floor. A ramp led from the outside to the second floor on which mules or horses were hitched to levers to turn the cranking devices to operate the press.[7] The adjacent boiling house is about twenty-two-by-one-hundred feet and was originally constructed on one level. Howard Coffin's 1922 restoration of the structure featured the addition of a second story. Near the sugar works, Spalding constructed other structures of tabby, including a barn or warehouse near the banks of Barn Creek. Spalding had brought the Sapelo plantation's Sea Island cotton here to be ginned and baled preparatory for shipment to the Savannah markets.

Spalding's tabby cane press and boiling house were in full operation by the start of the War of 1812, and sugar continued to be a valuable tidewater commodity well into the 1830s. Known as the "father of the Georgia sugar industry," Spalding established himself as the authority in the local industry in 1816 with his publication of a tract entitled *Observations on the Method of Planting and Cultivating the Sugar-Cane in Georgia and South Carolina*. Spalding had success with his marketing efforts in sugar into the early 1830s, partially due to the tariff placed on raw sugar during the War of 1812. Though the tariff was reduced soon after the war, prices continued to run high until about 1834, when sugar production began to slacken. The lack of tariff protection after that led to the gradual demise of the industry on Sapelo Island and other nearby locales.[8]

The Sapelo sugar manufactory fell into disuse during the Civil War, but it was used as a residence during the Reconstruction and early postbellum years by descendants of Thomas Spalding. Archibald McKinley, who married a granddaughter of Spalding in 1866 and moved to Sapelo to live in 1869, often wrote of the tabby ruins on the island. "We all went down to the Plantation [the Barn Creek sugar mill] where we intend building & I tried my hand at sawing tabby. We sawed twenty blocks & blistered our hands," McKinley wrote in 1870 shortly after moving to Sapelo Island.[9] The tabby foundation ruins of the press remain standing, and the boiling house restored in the early 1920s by Coffin now serves as the island post office and administrative facility.

Spalding also built his permanent residence on Sapelo Island of tabby. This imposing plantation "big house" was constructed from 1807 to 1810 of thick tabby walls and a flat roof. "My house at Sapelo is one story," Spalding wrote. "It is 90 feet by 65 feet in depth, besides the Wings. The Roof is of Tar and Sand. . . . The House is of the Ionic order. This house was built by six men, 2 boys and two mules (one White Man Superintending) in two years. . . ."[10] The residence was severely vandalized during the Civil War and fell into ruin during the last half of the nineteenth century. There was a partial restoration in 1907 by members of a Macon, Georgia, hunting club, which had purchased part of Sapelo Island, before a complete restoration was undertaken by Howard Coffin, from 1922 to 1925, in which the house was brought to its present appearance.[11]

Some of the best surviving examples of tabby architecture on the Georgia coast are at Chocolate Plantation on the northern end of Sapelo Island. Extensive tabby plantation remains, including a family big house, a detached kitchen house, barn, cotton house, mill works, slave quarters, and other outbuildings, repose in splendid ruin at Chocolate, a site that documentary evidence traces back to 1790 during a brief period of French ownership of Sapelo. Chocolate was the scene of extensive Sea Island cotton cultivation from about 1800 to the start of the Civil War. This tract was acquired by Thomas Spalding in 1843 and managed by his son, Randolph Spalding, whose family lived in the Chocolate big house until it burned in 1853.

A United States Coast Survey topographical map of Sapelo Island dated 1857 clearly delineates the Chocolate buildings, including the residence, barn, and two distinct rows of slave quarters. The tabby remains of the slave cabins on the site are some of the best surviving examples of this type of structure in tidewater Georgia. The remains of these buildings indicate the great amount of plantation activity associated with this portion of Sapelo Island. Coasting vessels are known to have stopped regularly at High Point on the north end of Sapelo to load Sea Island cotton baled at Chocolate. Cotton continued to be cultivated at Chocolate for a short time after the Civil War.[12]

Chocolate was part of the French Sapelo Company, in which five investors owned Sapelo and lived on the island from 1789 to 1795. The property passed to the ownership of Edward Swarbreck, a business associate of Spalding and his father-in-law, Richard Leake of McIntosh County. The tabby structures at Chocolate were built by Swarbreck during the period 1815 to 1819, almost certainly with Spalding's input and guidance.[13] In 1831, the plantation was sold to Charles W. Rogers of Bryan County. He built the tabby barn, which is still in use. The barn does not reflect the Spalding tabby concept, as do the other buildings on the site. It was restored in 1927 by Howard Coffin and was later used as a stable by the last private owner of the island, Richard J. Reynolds, Jr.

At High Point, about two miles north of Chocolate on the northwest tip of Sapelo, are the tabby foundation remains of a wooden structure thought to have been built by the last of the French

owners on Sapelo, John Montalet, in the first decade of the nineteenth century. This structure was later restored and used as a residence during the Reconstruction and early postbellum period, 1869 to 1880, when inland waterway steamboat traffic used the docks at High Point to embark and land passengers, mail, and freight.[14]

Another interesting tabby ruin is situated on the west side of Sapelo at Hang Bull. Here are the sizeable remains of what appears to be a cotton warehouse or some other type of plantation structure, likely built by Spalding in the 1830s. Hang Bull was part of a Sea Island cotton plantation, facing the nearby Duplin River, awarded as a gift by Spalding to his daughter and son-in-law, Michael J. Kenan of Baldwin County. Long-time island residents aver that this tabby work was used by island blacks as a church before and after the Civil War.

From 1816 to 1824 William Carnochan was one of the leading citizens of McIntosh County, as well as being a friend and business associate of Thomas Spalding of nearby Sapelo Island. Carnochan migrated to Georgia from Jamaica, where he had pursued activities attendant to the cultivation of sugarcane and the manufacture of rum.

The firm of Carnochan and Mitchell of Savannah advertised regularly in February 1817 that they had for sale "14 puncheons of 4th proof Georgia rum, equal in flavor and quality to Jamaica. A constant supply of the above can be had here [Savannah] or at the distillery, Darien, on very accommodating terms to country merchants and others."[15]

On the advice and counsel of Spalding (and a possible financial investment as well), Carnochan in 1816 had constructed a tabby sugar mill and rum distillery on the banks of Carnochan Creek in McIntosh County at the Thicket, five miles northeast of Darien, overlooking Doboy Sound and Sapelo Island. Carnochan's sugar works were constructed to specifications almost identical to those of the Spalding mill on Sapelo. The octagonal tabby base of the sugar mill at the Thicket is about forty-five feet in diameter; the boiling and curing house roughly corresponded in size and design to the Sapelo Long Tabby work.[16] There was, in 1937, inside the octagonal tabby walls, a series of cross walls, which were likely the foundations for a vertical roller sugar mill. The tabby of the octagon was made from the oyster shells of Indian kitchen middens. The tabby boiling house and curing house is just to the north of the cane press and is actually two buildings set together in the form of the letter T as advocated by Thomas Spalding, further evidence of Spalding's role in the design and construction of the Carnochan works at the Thicket.

North of the curing house at the Thicket are the tabby ruins of Georgia's first rum distillery, the main part of the structure being seventy-four feet in length and nearly thirty feet wide at one end with walls at the base two feet thick. In the vicinity of both the boiling house and the rum distillery are scattered remains of porous dark-brown bricks commonly used around Savannah in the nineteenth century. It is also known that T. P. Pease, owner of the Thicket property from about 1840 until his death in 1878 gave away or sold large amounts of brick to the freedmen who were building homes and other structures at the nearby Carnigan (a corruption of Carnochan) community.

Part of the sugar mill and rum house have fallen into Carnochan (Crum) Creek because of erosion of the bank over the past 170 years. Marmaduke Floyd, in his definitive treatise on tabby in coastal Georgia written in the 1930s, posits that Carnochan Creek was "perhaps more than" fifty yards east of its present banks when Carnochan and Spalding first built the structures. Cisterns and tabby foundations, along with scattered oyster shell, are now visible at low tide in the salt marsh and the mud flats of the creek. Some of the shell is known to have been brought in by lighter in the mid nineteenth century by T. P. Pease to help retard erosion of the

bluff.[17] This occurrence is substantiated by the recollections of Pompey Grant, born a slave at the Thicket in 1855 and interviewed by Marmaduke Floyd in the 1930s, who confirmed that the creek was much farther away from the mill structures. Grant also noted that the octagonal tabby cane press was used for various domestic purposes after the Civil War, including as a residence and farm structure. Because of the continuing erosion of the creek bank, the cane press tabby is dangerously close to being totally lost. Trees and portions of tabby are already in the mudflat.

In September 1824 a hurricane of exceedingly destructive force swept the lower Georgia coast and destroyed most of Carnochan's sugar and rum distillery facilities at the Thicket. "Mr. W. Carnochan, at the Thicket lost all his buildings, crops, &c., and one negro drowned," one contemporary account noted.[18] Carnochan died unexpectedly in 1825.

Another interesting feature of the Thicket site is the ruins of four double-occupancy tabby slave houses about 250 yards northwest of the mill site. The tabby comprising these cabins appears to be based on the Spalding method. It is possible that these and other plantation structures on the site, which have since disappeared, were constructed shortly after 1825, when Thomas Spalding acquired the property in his own name after the death of Carnochan. Spalding is known to have cultivated cotton on the Thicket tract in an operation managed by his son, Charles H. Spalding.

In addition to Sapelo and the Thicket, there was a third tabby sugar works built in the same time period, again based on the Spalding plan. This was the sugar mill of Dr. Robert Grant at the Elizafield rice plantation on the south bank of the Altamaha River (Glynn County side) about five miles south of Darien. These tabby ruins, thought at one time to be the remains of a Spanish mission (San Domingo de Talaje), were proven by the investigations of Marmaduke Floyd and James Ford in the 1930s to be the remains of an octagonal cane press and rectangular sugar manufactory building.

In 1819 William Carnochan, again with Spalding's probable participation, constructed a sizable two-story tabby warehouse on lot no. 1 on the Darien waterfront. This facility, the ruins of which are situated immediately east of the present Darien River bridge, undoubtedly was built to facilitate more efficiently the shipment of considerable quantities of Thicket sugar, molasses, and rum to the larger market in Savannah. Carnochan seems to have used this structure for warehousing these valuable commodities at least until September 1824. During this period Darien experienced rapid growth and development of its port facilities on the Altamaha River due to the shipment of increasing amounts of upland-grown cotton and locally cultivated rice.

Period documents indicate considerable commercial activity associated with the tabby structures along the Darien waterfront during a period from 1815 through 1861. Waterfront fires in 1812 and 1824, in addition to the destructive hurricane of 1824, proved to be only temporary setbacks to Darien's rapid commercial development during the period. By 1830 Georgia was the world leader in the export of cotton, and one-third of that was being shipped from Darien.[19]

Archaeological investigations conducted amid the tabby ruins of Carnochan's structure on the Darien waterfront have yielded evidence of barrels and barrel-making activity, which would be consistent with the types of commercial activity known to have occurred on the site during the antebellum period.[20] Carnochan shipped from Darien in heavy wooden tierces (barrels containing about forty-two gallons) the sugar, rum, and molasses produced at his Thicket manufactory. It is quite possible that he also shipped these commodities directly from his mill, by coasting vessels entering Carnochan Creek at high tide.

Subsequent activities on the Darien waterfront have been established through the linkage of surviving documents of the

period with recent archaeological work to indicate the storage of considerable quantities of naval stores products in the 1819 tabby building constructed by Carnochan. Chief among these products would be rosin stored and shipped in wooden barrels. Rice, including "clean" rice already pounded and hulled and "rough" rice still in the hull, also would have been shipped in large wooden tierces from Darien.[21] By 1835, increasing amounts of rice were being shipped from Darien. Rice fields were cultivated across the Darien waterfront on the islands of the Altamaha delta, and the proximity of the port made Darien a logical place from which to ship this increasingly valuable commodity to the larger markets of Charleston and Savannah. Altamaha rice, particularly on the larger plantations such as Broughton, Butler's, Champneys, and Cambers islands in McIntosh County and Hofwyl, Elizafield, Altama, and Hopeton on the Glynn County side of the delta, accounted for almost one-third of all the rice marketed from tidewater Georgia in the peak decades of the 1850s and 1860s.[22]

In 1839 Carnochan's tabby warehouse came into the possession of Jacob Rokenbaugh, a prominent local businessman, timber broker, and owner of the Darien Eastern Steam Saw Mill at Lower Bluff, one mile east of town. The 1850 McIntosh County census denotes Rokenbaugh as a merchant and sawmill owner; additional records indicate that Rokenbaugh probably used the second floor of the large tabby building, with front access to Broad Street on the upper bluff, as a mercantile, with the lower part of the building, convenient to steamboat wharves and schooner docks on the waterfront, as a warehouse.

Rokenbaugh marketed naval stores, chiefly raw timber, turpentine, and rosin. His naval stores business would again be consistent with the types of activities that the archaeological evidence has revealed in the lower level of the tabby warehouse. Contemporary accounts throughout the later antebellum period indicate the regular appearance at the Darien waterfront of coasting vessels to load naval stores, upland cotton, and rice.[23]

The foundations of several other tabby buildings are on the Darien waterfront on both sides of the bridge. A series of stereoscopic photographs taken in 1874 clearly depicts the bottom halves of tabby structures along the waterfront?—substantive proof of the widespread damage caused by the burning of Darien in June 1863 by Federal troops from Saint Simons Island. The tabby foundations of these structures are shown to have survived the waterfront fires, but the upper, wooden portions of the buildings were destroyed. Two of the 1874 photographs provide excellent views of the mostly roofless exterior of the two-story tabby warehouse built by Carnochan in 1819. One of the photographs shows that at least a portion of the building had been reroofed and probably refloored following the 1863 fire. Final destruction of this and adjacent structures occurred in another major waterfront fire in early 1887. Charred boards, nails, and other burned items have been dated to the fire of 1863. A stratum of oyster shells in the former tabby warehouse appears to come from the adjacent oyster cannery operated by the Ploeger Packing Company in the early to middle twentieth century. The foundations of most of the structures in this section are still evident.[24]

The river-level tabby ruins on the west side of the Darien bridge, in addition to at least one two-story structure on the upper bluff fronting on Broad Street, were built around 1815, following the waterfront fire of 1812. These buildings housed a cotton exchange, mercantile, ship chandlery, and cotton warehouses during the antebellum period but were lost, except for the tabby portions, in the 1863 fire. There is archaeological, as well as documented, evidence to support the probability that the structures west of the bridge were used as storage sheds for lumber during the Reconstruction and postbellum periods of Darien's commercial history, during the years when the town's lumber

industry was the most productive of any locale on the U.S. east coast. Henry Todd built one large sawmill adjacent to the tabby ruins on the riverfront, and the lower portions of the tabby buildings were at least partly roofed for timber and lumber storage.[25] The hurricane of 1898, which flooded the lower bluff section near the tabby ruins and scattered timber for miles, helped speed the rapid decline of Darien's timber trade by the start of World War I.[26] None of the tabby structures on the waterfront were used to any appreciable degree after that time.

Summary and Conclusions

The use of tabby, as advocated by Thomas Spalding, came to be widespread on the south Atlantic coast in the first half of the nineteenth century. Examples of such tabby works as plantation buildings and residences are in evidence at Hilton Head and Daufuskie islands in South Carolina, at the Kingsley Plantation on Fort George Island in Florida (Saint Johns River mouth), and in Georgia at the John H. McIntosh sugar mill ruins near Saint Marys (1825) and numerous sites on Jekyll, Saint Simons, Sapelo, Saint Catherines, Ossabaw, and Skidaway islands. Other distinctive tabbies are found on the adjacent mainland in Camden, Glynn, and McIntosh counties. Most, if not all, of the tabby structures in these areas reflect the Spalding influence. Spalding, who freely shared his tabby concepts with his contemporaries through his writings in the agricultural journals of the day, is credited with spurring the revival of interest in tabby in the first half of the nineteenth century.

The availability and abundance of shell and other materials in tabby were strong motivations for its use by local planters and businessmen for farm structures, sugar mills, slave quarters, warehouses, and other structures. The usefulness and durability of tabby are attested to by the numerous surviving examples of tabby architecture in the Georgia tidewater in the form of ruins or through tabby structures built in the early nineteenth century that have been restored and are still in use on the eve of the twenty-first century.

Notes

1. Buddy Sullivan, *Early Days on the Georgia Tidewater, The Story of McIntosh County and Sapelo*, 5th ed. (Darien, Ga.: McIntosh County Commissioners, 1997), covers in detail Spalding's activities on Sapelo Island, 1802–51.

2. Spalding's biographer is E. Merton Coulter, whose *Thomas Spalding of Sapelo* (Baton Rouge: Louisiana State University Press, 1940) remains the definitive account of the man and his times.

3. Marmaduke Floyd, "Certain Tabby Ruins on the Georgia Coast," in E. Merton Coulter, ed., *Georgia's Disputed Ruins* (Chapel Hill: University of North Carolina Press, 1937), 111?41. This meticulously researched tract debunked the myth that Georgia coastal tabby ruins were the remains of Spanish mission structures from the sixteenth and seventeenth centuries by proving conclusively that they were, in fact, structures associated with plantations in the early nineteenth century. The so-called "Spanish Mission Myth" had been advanced by historians in the first two decades of the 1900s and received great exposure, even nationally as shown in a February 1934 photo-essay in the *National Geographic Magazine*. In 1937, Floyd assembled period documents, letters, and plantation accounts to prove conclusively that the tabbies were the remains of sugar mills and other farm structures.

4. Thomas Spalding, *Observations on the Method of Planting and Cultivating the Sugar-Cane in Georgia and South Carolina* (Charleston: Agricultural Society of South Carolina, 1816), in Coulter, ed., *Georgia's Disputed Ruins*, 229–63.

5. Spalding, "On the Culture of

Sugar Cane," *Southern Agriculturist* 1 (1828), 552–56; Spalding, "On the Cultivation of Sugar Cane, erecting of proper buildings, and manufacturing of Sugar," Southern Agriculturist 2 (1829), 55–63; Spalding, "On the Mode of Construction of Tabby Buildings, and the Propriety of Improving Our Plantations in a Permanent Manner," *Southern Agriculturist* 3 (1830), 617–21; Spalding, "On the Construction of Sugar Mills," *Southern Agriculturist* 5 (1832), 281–85.

6. Spalding to N.C. Whiting, July 29, 1844, quoted in Coulter, ed., *Georgia's Disputed Ruins*, 72?76.

7. Spalding, "On the Mode of Construction of Tabby Buildings," op cit.

8. Floyd, "Certain Tabby Ruins on the Georgia Coast," in Coulter, ed., *Georgia's Disputed Ruins*, 88–98.

9. Archibald C. McKinley Journal, entry of May 28, 1870, quoted in Robert L. Humphries, ed., *The Journal of Archibald C. McKinley* (Athens: University of Georgia Press, 1991).

10. Spalding to N. C. Whiting, July 29, 1844, quoted in Coulter, *Georgia's Disputed Ruins*, 72–76.

11. Sullivan, *Early Days on the Georgia Tidewater*, op cit., has detailed accounts of the various phases of the Sapelo Island mansion's construction, 99–101, 135–37, 429–30, 611–18.

12. Ibid.; for Chocolate Plantation, see 85–89, 135, 388, 400, 765, 768, 826.

13. John L. Hopkins, in "Messalina's Questions or, A Vindication of Slavery. Interview V. Part I. Dwellings of negroes" (Liverpool, England, 1821), describes the tabby buildings at Chocolate, which at the time of publication had been only recently built. This tract is quoted in Sullivan, *Early Days on the Georgia Tidewater*, 826.

14. Archibald McKinley Journal; Sullivan, *Early Days on the Georgia Tidewater.*

15. *Columbian Museum and Savannah Daily Gazette*, February 10, 1817.

16. Floyd, "Certain Tabby Ruins on the Georgia Coast," 120, in Coulter, ed., *Georgia's Disputed Ruins.*

17. Ibid., 124–26. Also, Sullivan, *Early Days on the Georgia Tidewater,* 101?7.

18. *Savannah Georgian*, September 25, 1824.

19. Fred C. Cook et al., "An Historical, Archaeological and Architectural Study of the Darien, Georgia, Waterfront, Cultural Resources Mitigation of State Site 9Mc367, Phase 1" (Darien, Ga.: McIntosh County Industrial Authority, 1991), 19–30; also see McIntosh County Deed Records, 1818–71, Clerk of Court, McIntosh County Courthouse, Darien, Georgia.

20. Cook et al., "The Darien, Georgia, Waterfront," op cit., 52–53, 56.

21. Sullivan, *Early Days on the Georgia Tidewater*, op cit., 157–59, 351–53, 705–6.

22. Albert Virgil House, ed., *Planter Management and Capitalism in Antebellum Georgia* (New York: Columbia University Press, 1954).

23. Frances Anne Kemble, *Journal of a Residence on a Georgian Plantation in 1838–1839*, John A. Scott, ed. (New York: Alfred A. Knopf, 1961), 96–97.

24. Cook et al., "The Darien Waterfront," 27–28, 65. Excavations made in 1990 on this site substantiated the 1885 Sanborn Insurance Co. map of Darien, which revealed that an ice house, a saloon, and the office of the *Darien Timber Gazette* were located on the upper bluff in this section, above the tabby ruins.

25. Martin R. Dickinson and Lucy B. Wayne, "Cultural Resource Impact Mitigation for the Darien, Georgia, Sewer System Project" (Gainesville, Fla.: Water and Air Research, 1986).

26. Buddy Sullivan, ed., *The Darien Journal of John Girardeau Legare,* Ricegrower (Darien, Ga.: City of Darien, 1997), 15–16, 53–55.

On the Tabby Trail

Lee Meyer

Architecture is the link that spans time, distance, and place. It is the crucible in which human experiences are mixed with all the elements of nature and transformed into a higher order of utility.

It is the reaffirmation of the human spirit to express the aspirations and faith of accomplishment. It transcends space in time moving as the waves fall on the beach repeating the ebb and flow of tide and obeying all the laws of nature. Architecture provides a universal means of communication. And so it was after the discovery of the New World in 1492 that the Spaniards came to explore the southern coast of this land of islands, rivers, and ancient people.

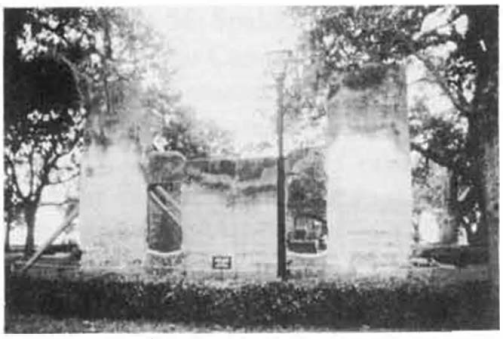
They crossed the Atlantic during winter storms of crushing waves under turbulent sky. They came in the summer seasons of becalmed seas under brilliant bands of sunlight of cloudless sky as well. They crossed the broad expanse of the Atlantic with hurricane winds blasting their ships, with thunderous howling water blinding the eye and numbing the spirit.

Having faith that their mission would guide them to the safety of the calm shores of a distant land, they came with swords, arms, and religion to spread the word of their faith and if needed defend to the death those beliefs and bring civilization to this new world. They brought all the knowledge of their age to this new place and adapted the old to become the new.

The basic building system of construction used by the Spanish was made of *tapia.* Tabby was a form of concrete made of burnt oyster shell, oyster shell, sand, and water. It was an ancient craft. This technology was used in the Mediterranean regions of Europe and practiced in countries and places near the sea.

The first experience I had with tabby was at the John McIntosh Sugar Mill ruin in Camden County, Georgia, in 1984. Bradley T. Smith, a preservation architect formerly with the Georgia State Historic Preservation Office and later a member of our firm, had visited this mill and had recognized the need to document and preserve it. A team of architects, including Brad Smith, Michael Day, and Tia Jones, was dispatched to the site.

We used rectified photography to document the wall elevations. We accomplished this purpose by setting targets at an equal distance from the walls to a parallel plane from which photographs were taken. They were then enlarged to a given scale of one-quarter inch. These photos were traced onto mylar plastic sheets and drawn with technical barrel-type pens called Rapidographs. Floor footprints were measured and drawn showing the floor plan of these walls. Archaeologist Tom



Exterior walls of the slave hospital at Retreat Plantation, Saint Simons Island, Georgia.

Eubanks developed notes, which we incorporated, that dealt with the careful removal of vegetation that had grown on the surface of the tabby walls. He also recommended the removal of roots intruding into the lower portions of the walls. We also provided drawings and specifications for repairing portions of the walls which had deteriorated. The remedial work was put out to bid and was completed.

The next effort with which we worked was the stabilization of the slave hospital of Retreat Plantation at Saint Simons Island, Georgia, which we accomplished in 1994. We provided measured drawings and photographs of all the wall surfaces with notes and a construction manual, which contained specifications to stabilize the existing conditions. We experimented with chemically analyzed samples of material to have the new material match the composition of the existing. Our concerns were the density of new versus old and the effects of seasonal temperature changes. We were also concerned with color and texture (size of shells and color of sand).

We started with the Spalding formula and experimented with several water-to-lime ratios until the right mix worked. This effort brought the Sea Island Company an award from the Georgia Trust for Historic Preservation. We also used similar technology to renovate the exterior of their gift shop and a small cabin at Epworth by the Sea.

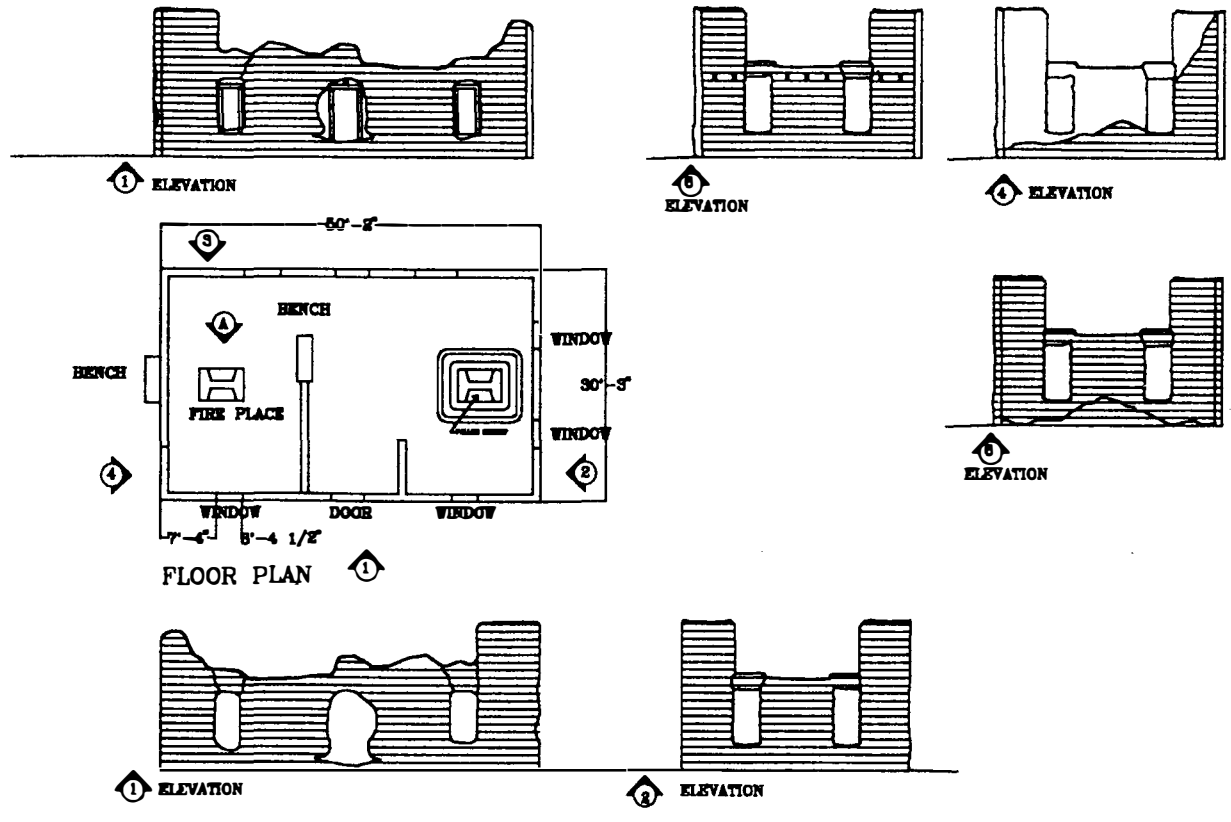
The next tabby endeavor was the documentation of the John Couper ruin

New wood framing at the slave hospital at Retreat Plantation, Saint Simons Island, Georgia.

at Cannons Point on Sea Island, Georgia. We photographed both from eye level and from a height of thirty feet from a bucket truck. We established a twenty-foot grid over the entire site. We also provided an additional north-south grid for each wall and column location. This allowed easy identification of each component. The purpose of this phase of the work was to identify the existing ruin and then to develop a program to stabilize and preserve it safely. The same technical data used at the slave hospital will be used for the work at the John Couper ruin.

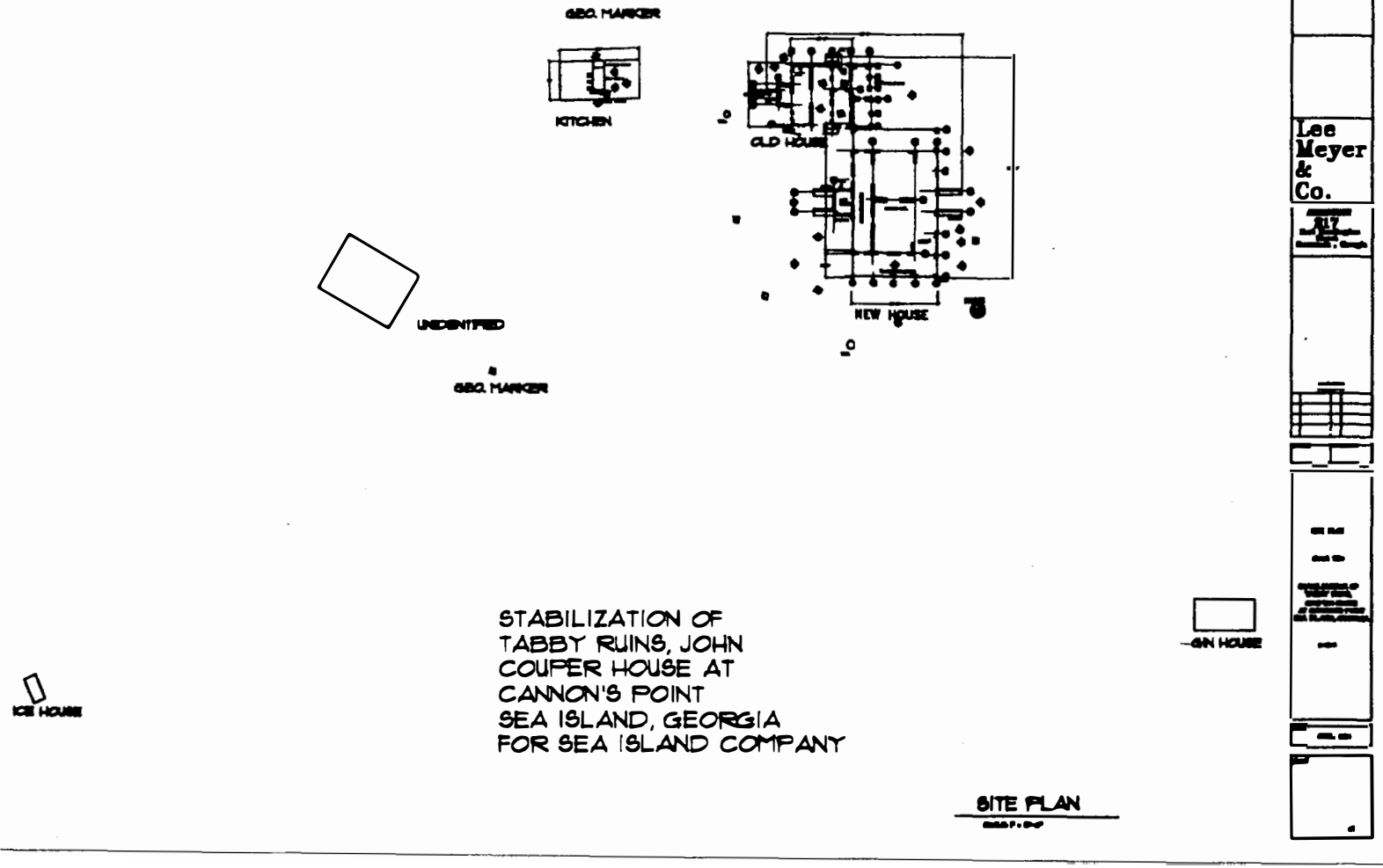
The challenge for this generation is to preserve the technology of the past for the benefit of future generations. Our ability to accomplish this task is a measure of our stewardship and concern with what is significant about our era. If we choose to become a part of the positive history of this nation, with wisdom and knowledge we march to a destiny of maturity. The benefit is the enrichment of the human spirit as expressed in our architecture.

Tabby technology needs to be preserved. The opportunity is ours.



Tabby construction of the hospital at Retreat Plantation, Saint Simons Island, Georgia

THE JOHN COUPER HOUSE AT CANNONS POINT AT SEA ISLAND GEORGIA
FOR THE SEA ISLAND COMPANY, SEA ISLAND, GEORGIA



Tabby
Engineering Characteristics of a Vernacular Construction Material

David C. Fischetti

Tabby, like historic brick masonry, receives little attention among the general public or within the construction industry. At the present time research funds for construction-related topics involving coastal issues flow towards wind design, exterior insulation systems, and the geophysical interaction of wind and ocean on shoreline development. In general historic materials research takes a back seat to other civil engineering endeavors. A discussion of tabby as a construction material must always begin with a definition or a description, because it is unknown to most people in the construction industry.

Tabby is an early cast-in-place construction material consisting of sand, lime (from shells and wood ash), and water. Tabby can be considered a lime-based concrete, unreinforced, with shell and shell fragments serving as the coarse aggregate. Methodologies used for the analysis of unreinforced concrete can be applied to tabby, as an unreinforced concrete product. As in the evaluation of any historic structure, the assessment of tabby depends on field observation and measurement, testing, analysis, and engineering judgment.

Historically, the quality of tabby construction was dependent on word of mouth tradition as well as the quality of local materials available and the skill and knowledge of the workmen and their supervisor. The recipe, based on an oral tradition, usually varied from the Spanish-, Portuguese-, or Dutch-speaking Caribbean region to the English colonies and was influenced by African traditions.

Tabby Materials and Proportions

The reprint of the 1867 edition of the *Encyclopedia of Architecture* defines concrete as "a compound of ballast, or stone chippings, and lime mixed together. It is so called from the speedy concretion that takes place between these particles." Since ancient times chemists and others have formed various opinions about the effect of sand and lime in the formation of mortar. Nineteenth-century publications detail various methods of making mortars and cements of lime. Coal cinders, furnace slag, brick dust, wood ashes, and other ingredients find their way into various reci-

pes for lime mortar.

In about 1843 portland cement was developed. Lime and clay are combined by burning. The resulting clinker, ground into a fine powder, made a cement much superior in durability to natural cements. When employed in a mortar or a concrete, it was far superior in strength and hardness. Within fifty years most concrete employed portland cement in lieu of lime cement.

Tabby consists of oyster shell and pit sand aggregate bonded together with homemade lime and water. The mixture is placed between form boards, which are held together with wood form and wedges. The tabby mixture was rammed or tamped into place to fill the form properly, without voids. The construction of a wall proceeded upward in twelve-inch lifts in a fashion similar to a slip-formed, cast-in-place concrete wall.

Compressive Strength

Depending on the mix and the time and quality of curing, the compressive strengths of new tabby probably ranged between 250 psi and 1,000 psi. Additional sampling and testing should be encouraged in order to increase the body of knowledge regarding tabby strength. Compressive strength is also an indication of hardness, durability, and impermeability.

Samples of historic tabby, when tested, have yielded fairly good compressive strengths. Dr. Lauren B. Sickels-Taves has recently tested tabby samples from the Cumberland Island National Seashore for the National Park Service. The results of the tests were as follows:

Analysis of Original Tabby:
compressive strength—350 psi
absorption—84.58
specific gravity—2.013
formula—1:3:1 lime:sand:shell with wood ash
stereology—inland beach sand

The analysis of tabby ruins or tabby buildings begins with the determination of compressive strength. A preliminary evaluation might depend on nothing more than an assumption, based on engineering judgment, for compressive strength.

Tensile Strength

Tensile strength of tabby is probably 10 to 15 percent of the compression strength. In an unreinforced tabby structure, low tensile strength would significantly affect serviceability. Considerable cracking would occur during both initial shrinkage and subsequent seasonal cycles in temperature.

All walls supporting lightly loaded roofs are subjected to tensile forces due to lateral loads or uplift due to wind. For this reason, the tensile strength of tabby must be determined.

Most tabby ruins are the remains of buildings that were destroyed by high winds. Presumably high winds pulled off the roofs of these structures and caused some walls to collapse. The low tensile strength of tabby and the lack of anchorage of the roof structure to resist uplift contributed to these failures.

Shear Strength

The shear strength of tabby is probably about 50 percent of the compressive strength, ranging from 35 to 80 percent. Shear strength must be determined when evaluating a tabby structure for lateral loads such as wind and earthquake. The model codes are beginning to mandate that sufficient testing be undertaken in historic buildings to determine the shear strength of unreinforced masonry buildings for seismic evaluation.

Although tabby is not a ductile material, seismic enhancement of tabby structures can be accomplished by increasing the ductility of the total system of walls,

floors, and roofs acting together. Tying floor and roof framing to tabby walls while allowing subtle yielding of the joints between the components can ensure the ductility of the total system.

Stress–Strain Curve

Concrete is usually tested by filling six-inch diameter by twelve-inch high cylindrical molds with concrete during job placement. These cylinders are allowed to set at the job site and then are transported to a testing laboratory to cure for seven or twenty-eight days. Out of a quantity of five cylinders, two might be tested at seven days, two tested at twenty-eight days, and one held in reserve. The samples are molded in accordance with ASTM C-31 and tested in accordance with ASTM C-39 by breaking them in a hydraulically powered compression machine that records load applied versus deformation. The strength at twenty-eight days is the compressive strength specified for the concrete. For example: "3,000 psi" concrete is actually "3,000 psi @ 28 days" concrete. Obviously historic tabby can not be sampled fresh and must be removed by cutting or coring it from an existing structure.

The testing of a cylinder of tabby or a test prism cut from a tabby wall can yield a stress-strain curve when stress is plotted against strain. The modulus of elasticity of a tabby sample can then be obtained. The results of this test are a measure of the stiffness of the material and are useful in determining the stability of unbraced walls.

Testing Tabby

Many of the methods of testing concrete and masonry can be applied to tabby. Because of tabby's continuity, which is superior to unit masonry, testing can be applied easily to samples, assuming that the samples can be removed, transported, trimmed, and capped without crumbling.

Olivia Alison, curator of the Telfair Museum of Art in Savannah, saved several cores obtained from HVAC work recently completed at the Owens–Thomas House of the Telfair. These cores, four and five-eighths inches in diameter, were taken from the thick interior tabby walls of the mansion. Two cores were transported to the Froehling & Robertson, Inc., office in Raleigh, trimmed, capped, and tested in a Forney 500,000-pound capacity testing machine. The core samples A and B failed at an ultimate load of 14,945 pounds, or 890 psi, and 15,499 pounds, or 923 psi, respectively.

These values, which are reasonably close, indicate that at a particular site consistent strength was probably often obtained. Great variations in tabby strength could be expected from site to site based on local traditions, available materials, and the experience of the workmen and supervisors.

In situ tests that have been developed for masonry can be applied to tabby. As with masonry and concrete, obtaining accurate values for compression and shear is important. Unit weight is a physical property often overlooked but important for analysis.

Wall Construction

Tabby walls are proportioned so that buckling due to slenderness is not a problem. Using the basic equation for unreinforced masonry or concrete walls shows that a height-to-thickness ratio of ten to one does not cause a reduction in strength due to slenderness. The eccentric loading due to timber trusses or large floor beams probably can be ignored if distributed on a thick wood plate.

Because of its relatively low strengths, tabby performs well when uniformly loaded. The support of a post or beam on a tabby wall is problematic when concen-

trated loads are not distributed, such as on a wood plate or brick masonry block.

At Saint Helena's Episcopal Church in Beaufort, South Carolina, the brick masonry sidewalls are supported on a tabby foundation wall that is twenty-six inches thick. The computed design pressure for the combined dead load and live load of 6.8 psi is low when compared to the 350 psi compressive strength obtained by Sickels-Taves. In Saint Helena's we have a fairly uniform load. There are no cracks in the sidewalls related to settlement caused by failure in the tabby.

Stucco and plaster applied to tabby walls not only protect them but also give them greater strength. A thorough analysis might include these materials in a composite section. The reapplication of these surface treatments provides an opportunity for reinforcing a tabby wall with metal lath, although corrosive environments may dictate that a stainless steel lath be utilized. The stucco layer can conceal earthquake anchors, which may be required to tie floor and roof structures to tabby walls.

Tabby Reinforcing

Inset wood grounds, nailers, or plates can provide the horizontal continuity in a tabby wall capable of resisting tensile forces due to lateral loads. Often these elements in historic structures are badly deteriorated and are in need of replacement. The tensile capacity of such elements is dependent on the net cross-sectional area of sound material, bond capacity, and continuity through joints.

Serviceability

Tabby is a surprisingly durable construction material when kept dry and free from freeze-thaw degradation. During construction the formula of lime, sand, shell, and wood ash mixed and placed under field conditions was subject to variation. Because tabby is an unreinforced lime-based cementacious product, only low strengths can be achieved in comparison with modern-day portland cement concrete. It is a durable material when protected by stucco, actually hardening with time because of carbonation.

Stabilization

The most appropriate stabilization for a tabby wall should be the same as any historic brick masonry wall suffering damage. Traditional repairs are the most direct, using similar technology to that available to the original builder. Walls function best when they are braced by floors and roofs. All masonry walls provide better service when they are part of an occupied building with an intact roof system.

The answer to preserving tabby should be similar to that of any other masonry system with repairs determined on a case-by-case basis. Protecting a tabby structure from moisture should be the primary goal.

Ruins Conservation

Structural stabilization of tabby ruins is required if close inspection by the public is to be allowed. Over a long period of time, tall unbraced walls and chimney structures tend to collapse because of high wind events. If subjected to a sufficient number of storms of sufficient magnitude, walls that remain are stable until deterioration reduces their capacity further. Bracing may be required if analysis indicates that a wall exceeds a certain maximum unbraced length that has been calculated or if calculations indicate that sufficient wind can be applied to overstress the free-standing wall. Because of the open nature of ruins, a free-standing wall is subject to wind forces from two directions normal to its face. Analysis is similar to a sign or solid fence, using building code wind-load factors for such structures.

Design and Analysis

Soil cement or terracrete requires pressure to help bind the ingredients because moisture and cement are both limited. Soil cement has been used in the manufacture of unit masonry by ramming the mixed ingredients by hand into a mold. The design and analysis of tabby, soil cement, and adobe should be similar.

Conclusion

Tabby is a traditional construction material important to the coastal areas of the southeastern United States and the Caribbean. To conserve historic tabby buildings and remaining ruins will require that we undertake sufficient research to understand this construction material better. Tabby can be analyzed in much the same way that unreinforced portland cement concrete is analyzed. Through observation, measurement, testing, and analysis, tabby structures can be evaluated to determine their structural serviceability.

The Conservation and Repair of Tabby in Beaufort County, South Carolina

Colin Brooker

The following paper is a revised version of an informal talk, "The Conservation of Tabby in Beaufort County, South Carolina," given at Jekyll Island Club Hotel on February 25, 1998, which presented tabby conservation and preservation projects undertaken since 1985 by Brooker Architectural Design Consultants in Beaufort, South Carolina, and on neighboring islands.

Beaufort County is exceptionally rich in tabby architecture, documented examples including town houses, plantation residences, slave dwellings, agricultural buildings, churches, stores, industrial establishments, and numerous ancillary structures.[1] First appearing near Beaufort Town during the colonial period (before 1735), tabby achieved maximum popularity soon after the American Revolution, remaining a versatile and sometimes ubiquitous local building material down until 1862 when the area was occupied by Union forces.[2] After the Civil War, traditional tabby-making never revived in Beaufort nor on its dependent islands, although substitute materials did develop just before the end of the nineteenth century; certain retaining walls[3] located along the Beaufort River are fabricated from portland cement and oyster shell aggregates circa 1880. Similar cement and oyster shell mixes, cast in twelve-inch-high vertical increments (coincidentally or otherwise like Thomas Spalding's early nineteenth-century tabby on Sapelo Island, Georgia) reappeared among a group of community buildings erected at Penn Center (formerly Penn School), Saint Helena Island, in the 1920s (Cope Building 1922; Frissell Hall 1925). Whether these should be categorized as tabby, neo-tabby, revival tabby, or formed concrete buildings is perhaps a topic for some future symposium. Personally, I prefer to postpone discussion of such materials until other local concretes (such as massive gun emplacements installed at Fort Fremont on Saint Helena Island in 1899) can be fully explored. Excluding post–Civil-War-period fabrics, then, my purpose here is to (1) characterize the historic tabby construction of Beaufort County, South Carolina; (2) examine factors contributing to its deterioration; (3) present an overview of past attitudes toward the preservation of tabby both in the southeastern United States and southwestern Europe,[4] (4) present brief information about stabilization methods developed by Brooker Architectural Design Consultants, emphasizing projects that have involved the conservation of ruins, since ruined tabby structures far outnumber standing ones in South Carolina.

Tabby Construction in Beaufort County, South Carolina

Tabby is a composite material, usually manufactured from oyster shell, shell lime, and sand mixed in roughly equal proportions with water. On some sites variants are seen, clay having been substituted for sand or possibly added to an oyster shell, lime, and sand mix at Whitehall Plantation[5] (circa 1800) located just over the county line, in what was once Beaufort District, at Grahamville, near Ridgeland, South Carolina. Mixes of similar type found a variety of uses, being poured into wooden molds to make tabby brick or directly onto prepared ground to produce floors and pathways. Structural work used timber forms reused at successively higher levels as construction proceeded. The process is well described by James Julius Sams (born 1826), who learned it from his father, Bernard Barnwell Sams (1787–1855) of Datha (now Dataw) Island, South Carolina: "The way of construction was to make a box or several boxes according to the length and width of the building, each box so many feet long, say about fifteen or twenty feet, and about one and a half feet wide. These boxes were put in place, filled with the [tabby] mixture, which was packed or pestled down, and allowed to stand until dry. The sides and ends of the boxes were held by moveable pins. When these pins were drawn out, the box would fall to pieces. The box was taken down and put upon the tabby already dry, and so box after box was packed and pestled until the walls were as high as you designed."[6]

Although Thomas Spalding's influence was pervasive along the Georgia coast both before and after publication of his "On the Mode of Constructing Tabby Buildings" by the *Southern Agriculturalist* in 1830, South Carolina's planters and merchants preferred construction techniques developed closer to home. Thus throughout the Low Country form height became standardized at about two feet some time before 1770, a preference that persisted until the late 1840s or early 1850s, when a few planters opted for twelve-inch- high forms of a kind recommended by Spalding.

Over the same period techniques evolved that allowed successful large-scale and multi-story tabby construction. On Dafuskie Island, South Carolina, for instance, Haig Point House (circa 1828?), one of the largest three-story-high tabby T-shaped domestic structures yet attested,[7] had its corners laid up in brick.[8] Although of minor significance, this detail is telling since it suggests long practical experience, the brick permitting fabrication of true right angles and protecting vulnerable wall areas from damage as cumbersome formwork was maneuvered into position during what must have a lengthy construction period. Here, as elsewhere,[9] external skins were tall and slender, becoming more slender with height, wall thickness being reduced at each floor level. By thus reducing mass builders achieved a material economy, tabby construction following principles evolved in the context of brick building regulated by building acts formulated for London after the Great Fire of 1666.[10] These regulations recognized that unless given lateral restraint, tall slender walls are unstable, a principal well understood by Beaufort builders, who after the premature failure of Fort Frederick (see below) came to realize that tabby under stress might easily fracture along lines of weakness such as pour lines. Indeed, by the last quarter of the eighteenth century, large-scale tabby buildings evidenced a judicious incorporation of timber supporting or restraining members, which helped achieve even distribution of loads and were capable (unlike tabby) of resisting tensile forces. Timber elements included floor joists, lintels supporting tabby over openings, window and door frames, porch construction buttressing external walls, and roof framing.

Judging from extant timbers or (in the case of ruined structures) impressions of lost elements, safety margins were never

high, floor joists and roof frames often appearing somewhat (or even critically) undersized.[11] But low safety margins reflect (besides use of top-quality lumber[12]), an attempt to minimize weight imposed on fragile tabby external skins, an objective aided by the development of linear floor plans and consequently shortened structural spans in the context of elite local residential building around the turn of the eighteenth century.[13] Even so, building high or building large with tabby always involved risk, Berners Barnwell Sams narrowly escaping death when a two-story outbuilding he was building in Beaufort collapsed about him. His son remarks: "The defect had been in one of the boxes. It had not been placed in a direct line, square with the others. In other words it produced a bowing wall and a bowing wall will certainly fail."[14] There could be hidden or latent defects too, core tests conducted at the circa-1780 Barnwell Gough House revealing unexpected areas of weakness resulting from faulty manufacture, poor compaction or differential weathering.[15]

Deterioration of Tabby Structures

If through fire, gale, or other accident, structural timbers of a tabby building are lost, then cycles of deterioration set in that, unless arrested, inevitably lead to deterioration and ultimate destruction. Multistory structures are especially vulnerable, Beaufort Town furnishing two documented cases of three-story tabby houses left standing as more or less intact shells after the Great Beaufort Fire of 1907 but in such unstable condition that they could not be salvaged (the DeSaussure House, built circa 1765; the Talbird House, built circa 1800). Both buildings were subsequently demolished. By contrast, on nearby islands where tabby structures were abandoned during the Civil War and not reoccupied (except by squatters), the process of deterioration sometimes proved lengthy. Several large but ruined plantation residences (the Sams House, Dataw Island; the Baynard House, Hilton Head Island; Whitehall Plantation near Grahamville) demonstrated a century-long history of decay, losses through looting for materials (notably brick), and progressive structural failure.

The aggregate effect of these various processes is well illustrated at the main Edwards House, Spring Island, South Carolina, a structure once comprising three separate building masses linked by porches. At the center of the composition stood a two-story tabby house with end chimneys. Erected around 1770, this phase 1 structure was enlarged by the addition of two symmetrical wings positioned right and left circa 1810–20 (phase 2), double-height screen walls providing visual continuity (although only minimal structural continuity) between phase 1 and phase 2 building.[16] Today, the central house has almost gone, surviving above-ground elements including heavily eroded fragments of the two end walls and three (of four) porch piers.

If little can be deduced concerning the nature and progress of deterioration here, the phase 2 south wing evidences all stages of structural impairment. Along north and south facades, disassociation is nearly complete, large sections of two exterior walls having fallen outwards, tabby shearing about openings and the fifth horizontal pour level. On the north elevation inherent weakness, created through employment of large doorways positioned one above the other at first- and second-floor levels, may well have precipitated collapse. These doorways, coupled with four flanking window openings, reduce wall mass to an unusual degree. Stable when braced by interior floor and exterior porch construction, the wall with its low solid/void ratio became endangered following destruction of associated timbers. Loss of bracing and the tying action of roof timbers accounts for the west facade's

present condition. Preserved to full original two-story height, this wall has moved nine inches out of vertical and is close to failure, exhibiting cracks above openings and splits along pour lines. Exterior walls of the north wing, however, although cracked, eroded and patched, stand nearly intact. Why such should be the case, when the north wing is an exact mirror image of its southern counterpart, is difficult to understand.

Similar (though less puzzling) patterns are visible (or were visible before recent consolidation) at an adjacent two-story-high tabby tenement apparently built (circa 1820) to accommodate household slaves. Again, the south entrance facade, which features many closely centered openings, has sustained substantial damage, breaking apart above second-floor level along the line of a decayed wall plate. Opposite, pierced by only one window, the north facade survives almost whole except above the central, upper-floor window opening where unsupported tabby has eroded. End elevations (each of which features four windows) are differentially preserved, tabby between upper openings on the west face having fallen in while the east facade retains integrity despite diagonal cracks and partial disassociation at the highest pour level.

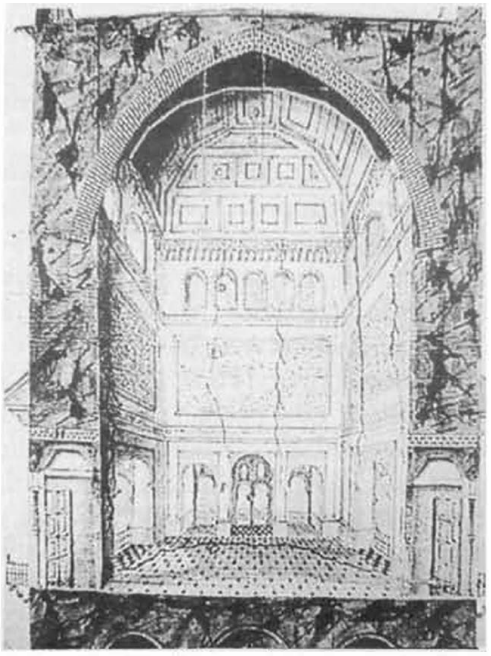
Once made roofless, both the main house and its principle outbuilding (like many other tabby buildings) soon lost their internal plaster and external two-coat stucco finishes, another factor contributing to decay because, stripped of its original coatings, tabby is susceptible to moisture penetration. In conditions of saturation followed by rapid drying, unprotected tabby will gradually disintegrate, the process being accelerated by frost, which causes moisture contained within the material to freeze and expand. Results include cracking and breakdown of bonding. Subsequent leaching of exposed tabby surfaces by rain exposes oyster shell matrices, thereby opening new avenues for moisture to enter an already impaired fabric.

The Conservation of Tabby Structures: A Historic Overview

Until recently little information concerning the long-term maintenance and repair of tabby was available to architectural conservators except in the form of previous attempts at stabilization, restoration, and conservation. These attempts and the various attitudes they reveal toward questions of intervention are briefly described below in the belief that they represent reservoirs of past experience that may prove useful in evaluating new methodologies or specific conservation techniques.

Reviewing the historic record, few instances emerge from Beaufort County of any systematic attempt to preserve tabby structures for almost a century after the Civil War. Rather, tabby's history over this period is one of neglect, dereliction, adaptation, and substantial loss, the Great Beaufort Fire of January 1907 already mentioned destroying at least five large tabby dwellings located on or near Bay Street in Beaufort Town. It is clear, however, that before 1862 most tabby structures received regular maintenance. Of particular importance was the annual application of lime washes to exterior stucco, the lime (usually derived from oyster shells) sealing minor cracks which otherwise might have allowed moisture penetration into underlying fabrics.[17] Major structural problems were also avoided through attention to detail at planning stages, local builders understanding the absolute necessity for salt-free tabby mixes (usually achieved by using well-weathered oyster shell robbed from prehistoric middens[18]), careful compaction of the material as it was laid up, and leveling to ensure true horizontal/vertical form-work alignment during casting operations.

Still, serious difficulties did arise. Fort Frederick on Port Royal Island (completed before January 1734) provided an instance where, through faulty workmanship or more likely stress caused by daily cannon shots, tabby walls cracked and disintegrated



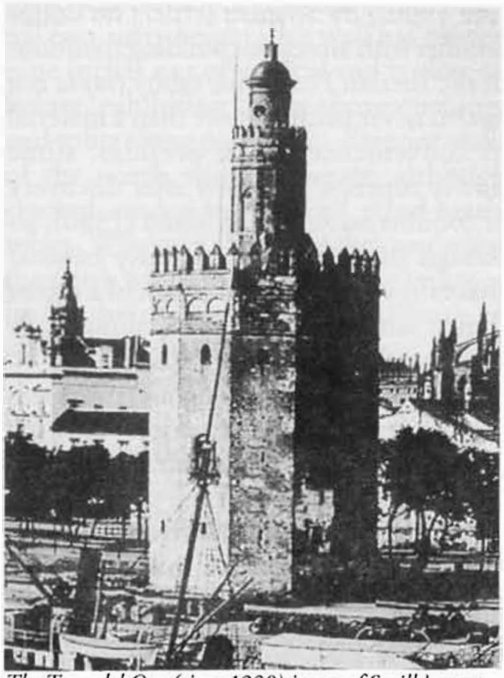
A 1686 drawing of the Torre de Comares at the Alhambra in Granada. Archivo General de Simancas.

soon after fabrication. In 1739 it was reported that the work had "almost gone to ruin," walls being "all down on the land side" where "the chief test part of the cannon" was positioned.[19] Projected rebuilding costs proving too high, the fort was (after prolonged argument) abandoned, serving as a quarry during construction of its successor, Fort Lyttleton (complete 1758 though still missing platforms and parapets in 1763). How unfamiliar tabby technology could seem to inexperienced builders, especially in isolated areas, is demonstrated by another defensive project, Fort Johnson on the Cape Fear River, North Carolina, where it was reported that *tapia* walls were commenced (circa 1793) "but so very thin were the walls, they would not, of themselves, stand to be filled up with earth, but gave way and fell down. The contract was broken off, and the imperfect attempt lay in ruins, as if an earthquake had thrown the surface into Hills and holes." [20]

Farther south, cracking and warping plagued tabby built houses at Saint Augustine, Florida, causing more than a hundred examples to be demolished between 1764 and 1788.[21] Introduced (before 1700?) by Spanish settlers no doubt familiar with analogous building traditions of the Iberian Peninsula, tabby *(tapia con ostion)* never became more than a material of convenience in the presidio, stone slowly superceding tabby after discovery of coquina on Anastasia Island (1580), although the settlement's poverty ensured that tabby construction (often of a rather flimsy kind) persisted on a minor scale down until at least the 1760s.

In Spain itself, analogous fabrics evidence not so much destruction following deterioration but patching and repair carried out over extended time periods. Relevant sites are scattered across Andalusia, Valencia, and Levantina in an area that under Islamic rule during the medieval period, evolved building materials (called *tâbiyah* by Arabic writers, *tapia* by Spanish ones) prefiguring tabby. These fabrics were manufactured using a variety of clays, sands, pebbles, limestones, and free lime mixed, poured, and pounded like tabby into standardized timber form-work. After the mix had achieved its initial set, form-work (called *louh* in Arabic sources) was (almost exactly as with tabby) struck and reused at successively higher building levels. [22]

The Torre de Comares, at the Alhambra, Granada, provides a memorable monument to such construction.[23] Erected circa 1340, this structure is about forty feet square and approximately seventy feet high and evidences numerous structural repairs. Post-medieval restorations are documented from 1588 down until the present time. A drawing dated 1686[24] is of unique interest, illustrating the structure riven by massive vertical cracks . Later records indicate that decayed, split, or otherwise impaired *tâbiyah* was gradually cut out and replaced with brick (a long-established practice documented at the Alhambra from 1590 onwards but known on other sites much earlier), the tower's continued structural integrity depending upon intermittent reconstruction episodes. Today, it can be seen that much medieval fabric has been replaced, brick corner rein-



The Torre del Oro (circa 1220) is one of Seville's most familar landmarks. (Late nineteenth century photograph).

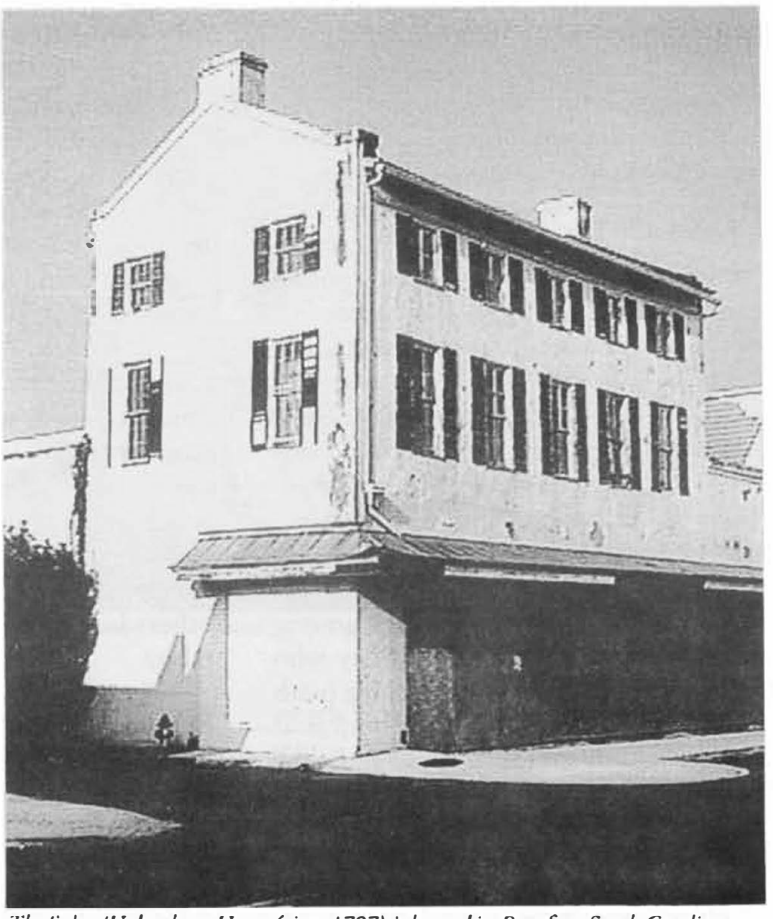
forcement constituting a conspicuous insertion.[25]

The Torre del Oro (circa 1220), one of Seville's most familiar landmarks, displays a similar shift, solid masonry replacing cast materials over time. Now giving the impression of a stone and brick monument, surviving fragments and late nineteenth-century photographs show that lower stages of the tower were originally *tâbiyah*.[26] Elsewhere modern Spanish conservators often follow similar precedent, patching decayed *tâbiyah/tapia* with brick, filling vertical cracks with lime-based mortars, and concealing the result under a stucco finish. Restoration of lost or damaged architectural elements is frequent. Seville's city walls typify the practice, presenting a palimpsest of original eleventh-century work; medieval or post-medieval repairs, and modern finishes. In Cordoba, large breaches in the city walls have recently been filled by casting mortar/gravel mixes into new form-work that replicates medieval form-work design with respect to height and tie arrangements. At the Alcazaba, Almeria, restoration of eleventh-century *tâbiyah* fortifications follows similar principles except that mass concrete (again poured to match original form-work height and details) is the modern material of choice, local restorers making frank distinctions between new and ancient cast fabrics.

North American restorers have taken several distinct approaches to the problem of repairing impaired tabby. An early essay occurred at the King's Magazine (1748–41), Frederica, Georgia, where fallen wall sections were salvaged and reconstructed (circa 1903) to produce a patchwork of new portland cement and old tabby sections reassembled without regard to original position or orientation. About thirty years later Thomas Spalding's ruined tabby house on Sapelo Island (built 1810–12) underwent even freer rebuilding; additions (including an enclosed swimming pool) and alterations (pitched roofs being substituted for the original flat roof, which had leaked since Spalding's time) changed the original building concept. While the entrance facade still echoes Spalding's carefully modulated design known from early photographs,[27] it is no longer certain if any original construction survives. Likewise, a tabby-built sugar boiling house erected by Spalding (before 1816) on the same island has undergone substantial rebuilding during the course of various twentieth-century conversion episodes, whatever exists of its early external walls now is buried under modern finishes.

Another egregious example of unsympathetic treatment of an important tabby structure is found at 802 Bay Street, Beaufort, South Carolina, where the Saltus/Habersham House, originally a gable-ended dwelling of three stories raised over an elevated basement, has lost lower portions of its long front (north) and back (south) walls. Built by a local merchant, Capt. Francis Saltus, circa 1797 and remodeled circa 1825, the structure survived the Civil War and its wartime use as a commissary with only minor modification. However its purchase at a direct tax auction by D. C. Wilson in 1869 initiated a period of major alteration. Wilson re-

moved original first-floor construction (which was raised about two feet above present grade), sealed the basement, installed a new floor at street level, and cut large display windows into tabby of the north facade to illuminate newly installed shops. Photographs indicate that with successive owners or tenants these display windows were gradually enlarged and the rear south facade was removed incrementally to facilitate provision of additional living space. Finally, following the building's purchase by Belks Inc. (1954), all remaining tabby of the lower north and south facades was demolished to a height of about eight feet above grade. Unrestricted circulation was achieved within a new department store, which both incorporated and extended south from the late-eighteenth-century building.[28]



The Saltus/Habersham House (circa 1797) is located in Beaufort, South Carolina.

Upper portions of the old house were supported on steel joists, this highly hazardous exercise made more so by installation of undersized steel supporting members. While the two end facades with their internal brick chimney stacks still stand intact, steel beams carrying upper front and rear tabby walls have deflected as much as seven inches, tabby fabrics above tearing and splitting to a point where the entire building is endangered.

Fortunately, more appropriate remedial measures have evolved in contexts removed from commercial exploitation or unsuitable reuse, one notable instance being the colonial town of Frederica, Georgia, where personnel of the National Park Service have developed unrivaled expertise in conservation and maintenance of tabby since the agency acquired the site. This is not the place to detail the progress of work at Frederica, although it does seem proper to observe that the agency strives to stabilize rather than rebuild tabby ruins, to carefully match new materials by physical characteristic and appearance to existing tabby when patching and other repair work become necessary, and to suggest the full extent or former appearance of ruined and excavated tabby structures through interpretive exhibits. Over recent years, Frederica's influence has become persuasive among architects and conservators charged with the preservation of local tabby resources.

In summary, historical accounts reveal attitudes toward impaired tabby and

tabby-like materials (such as Iberian *tâbiyah* and *tapia*) ranging between two opposite poles. Leaving aside accidental collapse due to faulty workmanship, at one end of the spectrum lie neglect, deliberate demolition, or demolition through neglect. These may be unacceptable practices today, but, judging by the six- to seven-hundred ruined tabby structures reported from Beaufort County, they represent usual paths in coastal areas of South Carolina besides being typical outcomes of a historic process documented from Saint Augustine, Florida, during the mid eighteenth century. At the spectrum's opposite end can be found extensive reconstruction or rebuilding, exemplified by work on Sapelo Island, Georgia, carried out during the mid 1930s and prevalent among certain Spanish conservators today who might argue that they are continuing (with new materials) long, established traditions documented in southern Spain since the late sixteenth century. Between these two extremes, Frederica, Georgia, suggests a middle course defined by limited intervention, re-creation of traditional building technologies (burning oyster shell for lime), and a reliance upon intermittent yet regular maintenance programs to bring a measure of stability to grossly impaired tabby structures.

Tabby Conservation in Beaufort County, South Carolina

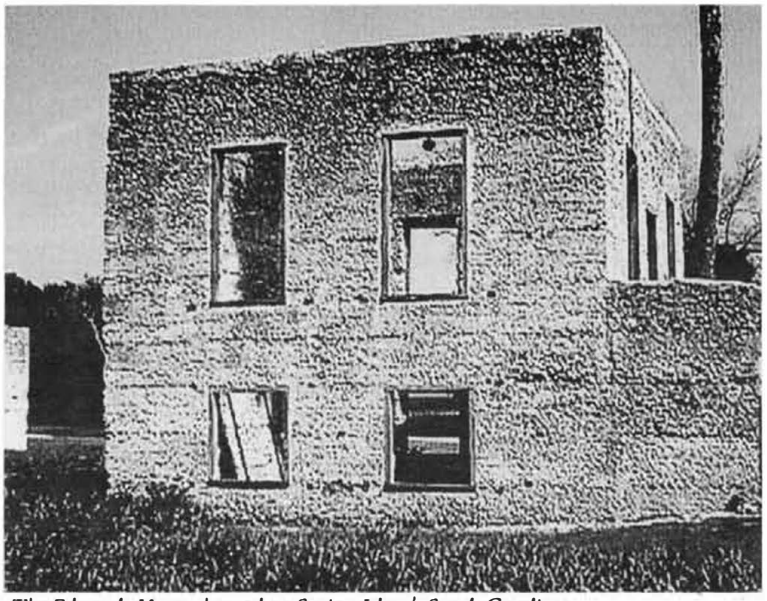
Few of Beaufort County's tabby buildings survive intact, the vast majority having fallen into ruin. In Beaufort itself only two structures approach their original condition and use, the Barnwell Gough House (circa 1780) and Tabby Manse (circa 1790), a pair of closely related two-and-a-half story T- shaped dwellings built to almost identical dimensions. Both were extensively renovated during the early 1980s, the first by Brooker Architectural Design Consultants. Elsewhere in Beaufort, most larger tabby dwellings attested by old photographs[29] have disappeared, and the Saltus/Habersham House, Chisholm House, and Anchorage (all located on Bay Street) remain in an impaired or altered state. On neighboring islands the situation is similar, standing tabby construction being for the most part lost or ruined.[30]

It is probably fair to say that deterioration of ruined tabby structures of the kind frequently encountered in Beaufort County can be slowed but not entirely arrested. Stability relies upon intermittent programs that first restore (if possible) a measure of structural integrity to building envelopes and second consolidate, cap, or otherwise patch fractured and/or eroded tabby.

In approaching any tabby structure, but more especially deteriorated or ruined examples, an essential first step is full architectural analysis. Typically work includes background research to settle questions of building chronology, phasing, or typology followed by detailed measured drawing and large format photography.

On numerous occasions owners have sponsored joint architectural/archaeological investigations to recover historic information concerning particular sites. A notable instance is the late eighteenth/early nineteenth–century Sams House site on Dataw (Dathaw Island), where ALCOA (South Carolina) Inc., as part of an agreement negotiated with the South Carolina State Historic Preservation Office, funded an investigative program (which included archaeological excavation, building conservation, and joint publication) over a ten-year period extending from 1983 to 1993).[31] Besides revealing aspects of plantation life not previously attested from Beaufort County, this investigation entailed extensive research into a broad range of topics related to tabby construction, research which has considerably broadened understanding of tabby's evolution as a structural medium. Currently local investigation is centered on urban rather than

rural tabby building, a group of owners sponsoring examination of three sites in downtown Beaufort where evidence is emerging for tabby structures (including houses, stores and various outbuildings) associated with mid to late eighteenth-century mercantile activity.



The Edwards House, located on Spring Island, South Carolina.

Of particular interest is the DeSaussure House, a three-and-a-half-story dwelling demolished in 1907 which, before excavation in 1995, was known solely from Civil War–period photographs. Built around 1765, this building is now represented by tabby foundations that define a structure measuring thirty-four feet north–south by twenty-six feet, two inches east–west (excluding porch construction). Remarkably, considering the violence of attested destruction episodes,[32] these foundations survive below ground in excellent condition. They were therefore backfilled after excavation and recording, reinterment being considered the most effective means of ensuring their preservation. Similarly, on Daufuskie Island, the massive tabby foundations of Haig Point House were reburied after excavation in 1988.[33] However, before reburial, all excavated tabby was capped with new lime-based fabrics. The capping is of sufficient depth (six to twelve inches) to reproduce the building's outline above grade, new materials being visible above ground while original tabby is preserved below.[34]

Standing tabby ruins present a different challenge, although the requirement that they be conserved in an environment now subject to intensive development or development pressure remains constant. The composite nature of tabby construction has already been emphasized, but it is worth repeating that timber played an essential structural role in large-scale/multistory form-cast building. An obvious preliminary step when dealing with buildings that have lost timbers but retain more or less coherent standing walls is to reconstruct critical framing elements. This technique was perhaps pioneered at the two-story tabby Horton House, Jekyll Island, Georgia, later being adopted by Brooker Architectural Design Consultants on Dataw Island, Spring Island, at the Baynard Ruins, Hilton Head Island and Whitehall Plantation near Grahamville.

In most cases stabilization has involved insertion of new pressure-treated timber or heart pine floor joists, wall plates, window frames, door surrounds, and lintels into the original tabby sockets, new materials being cut to match the lost originals. Usually if surface erosion is not far advanced, dimensions of lost timber members are preserved as tabby impressions.[35] At Whitehall Plantation, measured drawings made during the 1930s allowed exact replication of early window frames now destroyed. At Spring Island, although almost all timbers had disappeared before 1992, when the latest round of conservation began, enough remained of one window frame (carbonized during a fire) and

one lintel found *in situ* to allow reproduction of the rest. Likewise, carbonized fragments attested original scantling of first-floor joists spanning across the slave tenement located near the Edwards House, but for both the main residence and its outbuildings nothing survives of roof framing, making even hypothetical restoration uncertain.[36]

When a tabby building stands more or less intact (the Barnwell Gough House, Beaufort, for instance), repair of impaired structural timbers, while equally important, follows conventional preservation protocols. Normally, insertion of new timbers to replicate original members decayed to the point where they can neither perform their original task nor be salvaged offers few specific problems. But experience shows that on occasion restoration of an old load path or institution of a new one by replacing decayed beams, joists, or rafters can precipitate sudden and near catastrophic building failure. Weakened over time by moisture penetration, leaching, or mechanical injury, tabby walls or piers can shear in a matter of minutes. Such experience urges caution, close professional supervision, and adequate shoring during all major repair operations.

As unpredictable are problems associated with cracked or disassociated walls left standing after structural timbers have been lost and surrounding construction has wholly or partially collapsed. Stability may be an impossible goal without either reconstruction (which usually means casting new "tabby") or the introduction of elements foreign to the original built concept. The Sams House, Dataw Island, gives an instance of the latter. Here a horizontally split two-story-high tabby end wall of the badly ruined east wing was found to be moving under wind load and low-level mechanical vibration. As a precaution, the wall was subsequently enclosed (1986) within an armature fabricated from heavy timber upright and cross members, new timbers on outside and inside wall faces being bolted together by means of stainless steel rods inserted through original holes in the tabby left after form-work ties were removed. New timbers were designed to provide both horizontal and vertical bracing, high tensile steel guy wires (attached to the armature) counteracting (if kept tight) structural movement. This solution retains all original fabric and protects visitors against building collapse. Stability is achieved, however, at the expense of visual intrusion, since no attempt was ever made to camouflage new timbers or guy wires.

Following removal of vegetation[37] and installation of new structural timbers, conservation of the Sams House ruins also involved consolidation. Consolidation techniques include capping vulnerable horizontal surfaces (such as tops of walls) and patching friable or otherwise impaired vertical surfaces. Where tabby ruins are heavily weathered, problems arise concerning the appearance and perceived authenticity of the conserved structure. Ideally, any visible material employed should approach the original in terms of color, texture, or finish while still being identifiable as an intrusive element. The degree to which consolidated materials can be matched to eroded tabby is uncertain, though, and a clear distinction between new and old work must sometimes be accepted or the use of new materials limited. Generally I prefer wall capping cast to a depth of at least three or four inches and have avoided results that resemble thin icing drizzled over a cake.[38] On Dataw, damaged tabby walls were built up and capped (with lime-based materials) to produce horizontal planes, the capping being stepped where necessary to maintain horizontal emphasis. Such an application echoes the fact that tabby walls were constructed in a series of vertical lifts without actually reproducing lift levels.

Regarding materials, one should remember that patching and capping operations principally serve to prevent excessive moisture penetration into vulnerable top and vertical surfaces of otherwise unprotected tabby walls. Materials used in repair must be moisture resistant but not

wholly nonabsorbent and compatible with the historic fabric treated. When mortars are employed, choice of mix is critical, inappropriate materials accelerating rather than arresting decay.

As already mentioned, tabby usually contains lime derived from burned oyster shell. In modern masonry practice, lime has largely been replaced by portland cement, but portland cement is relatively impermeable. When it is applied to "softer" materials, the results are differential moisture absorption, cracking, and eventual disassociation. If, however, portland cement is used in conjunction with hydrated lime, these problems can be avoided, portland cement/lime mixes having the advantage of being more easily worked besides offering shorter setting-up times. On Dataw Island, the ratio employed of portland cement to lime was normally 1:2, a typical mix used in tabby wall repair containing 1 part white portland cement, 2 parts type S hydrated lime, 8¾ parts sand, and ¼ part well-washed oyster shell, all materials being measured by volume.[39] During application the substrate was carefully cleaned and thoroughly dampened, mixes being "thrown" onto vertical surfaces with a trowel. Every effort was made to prevent rapid drying, and new work was protected by damp cloths as necessary. At Frederica the National Park Service has employed "harder" mixes in a 1:1 portland cement:lime ratio and has experienced some cracking on vertical surfaces.

At the Sams House, visual harmony between new patching and original fabric was considered an important goal. Heavy concentrations of oyster shell were found to decrease both workability and adhesion of mixes, the texture of eroded tabby proving very difficult to reproduce. Color was successfully matched through use of white portland cement and local sands. Exterior two-coat stucco finishes[40] were repaired, but in accordance with the owner's wishes, these coatings were not renewed on any extensive scale, limited areas of new stucco applied to exterior wall surfaces being scored to imitate stonework.

Choice of mix for consolidation, in summary, is a matter of judgment based on field assessment of historic material condition and site-specific weathering factors. "Soft" mixes, while suitable for badly eroded or friable surfaces, will require periodic renewal and replacement. Final specifications should be proceeded by a thorough test program in which various mixes are monitored. It must be emphasized that for any given structure, tabby condition will vary, requiring the use of more than one mix.

In conclusion, I should perhaps add that after fifteen years' practice in Beaufort County, I find that the conservation of tabby remains an activity of uncertain outcome. Attrition of tabby ruins is a continuing and constant problem exacerbated by improved accessibility to historic sites brought by new bridges, roads, and subdivisions. Local landowners and corporations have been good stewards over the past few decades, but as control of important structures passes to homeowner associations or private individuals,[41] the burden of maintenance can become onerous or the case for careful repair, forgotten. Efforts are required throughout the Carolina Low Country to further document tabby, recognizing it as a prime historic resource worthy of both full protection and preservation.

Notes

1. Examples include garden walls, cemetery enclosures, and even tomb markers on Daufuskie Island.

2. Almost the entire white population fled Beaufort District after the Battle of Port Royal, abandoning town lots, plantations, and farms, which were subsequently confiscated and sold at auction by the Federal Direct Tax Commission. Very few original owners recovered their property or even returned to Beaufort District,

a circumstance that perhaps explains why marked architectural and constructional discontinuities are evident after the Civil War.

3. Protecting the eastern end of Bay Street, Beaufort, which is open on its south side to the river.

4. Because several symposium participants expressed an interest, information collected in southern Spain concerning various kind of medieval formed construction is included in this paper. If the context is Islamic I refer to such fabrics as *tâbiyah* (following the Arab historian ibn Khaldun); if the context is post *reconquista,* then I have employed the current Spanish term *tapia.* Research in Spain and North Africa was part funded by an NEH post-doctoral fellowship.

5. This large ruined house of tripartite plan (incorporating a central block built of brick flanked right and left by tabby wings) was probably built by Judge Thomas Hayward to replace his father's residence, Old House, destroyed by British raiders in 1779.

6. James Julius Sams, undated typescript titled "Dathaw," Caroliniana Library, University of South Carolina, Columbia.

7. See C. Brooker (1989). "Haig Point House: The Architecture" in *Haig Point, a Nineteenth Century Plantation, Daufuskie Island, South Carolina*, ed. Michael Trinkley. Chicora Foundation, Research Series 15, Columbia, S. C. Now ruined and partly reused, the building had a footprint (excluding porches) of about 3,200 square feet. According to my calculations, basement construction alone required fabrication of over 5,000 cubic feet of tabby, which must have demanded a far greater labor force than Thomas Spalding's "six men and two boys" who manufactured 135 cubic feet of tabby per week on Sapelo Island in 1805.

8. In southern Spain, similar details occur in medieval *tâbiyah* and *tapia* construction, one firmly dated example being the tower of el Carpio (Córdoba) where building corners are laid up (using stone at the lowest level and brick above) in alternatively long and short fashion corresponding to successive *tapia* lifts. After every fourth pour, there are single horizontal brick courses, which probably aid uniform stress distribution. *Tapia* consists of a lime/clay mix containing river-worn pebbles and small quantities of brick poured into forms 32–34 inches (81–86.5 cm) high. An inscription now *ex situ* (Palace of Duenas, Seville) records construction under "*maestre Mohammed*" for Garci Mendez de Sotamayor in 1363. See Leopoldo Torres Balbás (1952), Las torres de el Carpio (Córdoba) y de Porcuna (Jaén) *Al-Andalus* 17, 1:200–13.

9. Compare with the Saltus/Habersham House (1797), 802 Bay Street, Beaufort, S.C., where exterior wall thickness is as follows: basement, 1 foot, 9 inches; first floor, 1 foot, 6 inches; second floor, 1 foot, 3 inches; third floor, 1 foot.

10. In London, the relationship between wall thickness and building height was first controlled by a Building Act of 1619. This was followed by more regulation in the Building Act of 1667 and subsequently revised. For details see Dan Cruickshank and Peter Wyld (1975), *London: the Art of Georgian Building.* London, Architectural Press Ltd.

11. As at Coffin Point Plantation (circa 1800), Saint Helena Island, S.C., a three-story timber-framed building raised on a full tabby basement where primary supports for the central stair hall consist of a pair of 12-inch by 3-inch joists spanning 19 feet, 6 inches.

12. Usually heart pine or cypress. At the Barnwell Gough House, Beaufort, original floor joists are of cypress, main beams and roof trusses of pine.

13. T-shaped plans were popular immediately after the Revolution, but these could involve long structural spans, principle trusses at the Barnwell Gough House, Beaufort, spanning over 43 feet from front to back of the building. At the Saltus/Habersham House, use of a narrow, rectangular plan resulted in maximum structural spans of 24 feet.

14. James Julius Sams, previously cited.

15. Bearing capacity of samples taken from external walls was found to range between 25 psi and 350 psi. Calculations (by Trigram Associates, London) suggested that the long north elevation was unstable, and measures were taken to strengthen the structure throughout. Stainless steel reinforcement was inserted below floor surfaces, the north wall was underpinned and defective primary beams were replaced. Most lintels over windows (fabricated from unhewn oak limbs) were found heavily damaged and had to be replaced.

16. For history of site see C. Brooker (1990) "Tabby Structures on Spring Island" in *The Second Phase of Archaeological Survey on Spring Island, Beaufort County, South Carolina*, ed. Michael Trinkley. Chicora Foundation Research Series 20, Columbia, S.C.

17. An anonymous planter reported "being situated where my negroes procure many oysters, I make them save the shell, which they place in one pile, of which I burn lime enough each year, to whitewash my negroe houses, both outside and inside." *Southern Agriculturalist,* November 1836:580–84.

18. Inclusions of prehistoric pottery have been found in tabby on Spring Island, Daufuskie Island, Dataw Island, and Port Royal Island.

19. *Journal,* South Carolina Commons House of Assembly, February 7, 1740.

20. National Archives, RG 77b, Drawer 62a. Records of the Office of the Chief of Engineers. *Historical sketches of Fort Johnson in North Carolina, written April, 1819.*

21. See Albert Manucy (1978:68–73), *The Houses of St. Augustine, 1565–1821.* Saint Augustine, Florida. Saint Augustine Historical Society.

22. For contemporary description of medieval construction methods, see ibn Khaldun, *Muqqadima* (1967:2, p. 318.)

23. Typically at the Alhambra formwork was standardized to a height of 79–80 cm (31–32 inches), *tâbiyah* mixes being of finely graded gravel mixed with a red clay (which gives the palace its modern name). For description of the architecture in English, see Oleg Grabar (1978), *The Alhambra.* Cambridge, Harvard University Press. Unfortunately, Grabar gives little information about construction. Despite its rarity, awkward size, and date, the two-volume work by Jules Goury and Owen Jones (1842–45), *Plans, Elevations, Sections and Details of the Alhambra,* is still essential.

24. Archivo General de Simancas M.P, y DXIII–60; reproduced in *Cuadernos de la Alhambra* 9 (1973).

25. A comparison of the drawing of 1686 and detailed drawings prepared by Goury and Jones shows that a brick vault spanning the tower's main interior space at the end of the seventeenth century fell or was demolished before 1845. This vault was not rebuilt, roof construction being reconfigured in timber.

26. For description, see Leopoldo Torres Balbás (1934), "Las Torres del Or y de la Plata," en *Sevilla* in *Archive Espanola e Art y Arqueologia*, no. 29

27. See Mills Lane (1990:69–70), *Architecture of the Old South, Georgia.*

28. Colin Brooker (1996), *Architectural and Archaeological Investigation at 802 Bay Street, Beaufort, South Carolina.* Beaufort. Brooker Architectural Design Consultants.

29. By fortunate chance images of many lost Beaufort buildings are preserved in Civil War period photographs taken mostly by Samuel Cooley. Collections are held by the National Archives, Beaufort County Library, and Historic Beaufort Foundation.

30. For inventory see Bruce G. Harvey, C. Brooker, David B. Schneider, and Sarah Fick (1998), *Above-Ground Historic Resources Survey of Beaufort County, South Carolina.* Brockington and Associates Inc., Brooker Architectural Design Consultants, Historic Beaufort Foundation, Preservation Consultants Inc.

31. Results are summarized in Eric C. Poplin and C. Brooker (1994), *The Historical Development of Dataw Island, Ar-*

chitectural and Archaeological Investigations at the Sams Plantation Complex, Brockington and Associates Inc. (Atlanta, Charleston), Brooker Architectural Design (Beaufort, South Carolina).

32. At least two successive structures are known to have occupied the site after 1907, the second also being destroyed by fire.

33. Sponsored by International Paper Inc.

34. This area is now planted in Bermuda grass, which contrasts well with the capping that presents visitors with an actual size plan of the original building.

35. At the Sams House, Dataw Island, impressions showed that the kitchen chimney opening was originally spanned by two parallel timber members. The outer one measured 11 feet 7 inches long, 10 inches wide by 6 inches deep; the inner lintel measured 8 feet 3 inches long, 9 inches wide, and 8 inches deep. Both members were reproduced to their original dimension in pressure-treated timber, the new timbers being reset into the original sockets, an exercise designed to preserve integrity of the tabby chimney base and tabby brick stack above.

36. Although candidates exist (notably a group of three slave houses at Haig Point, Daufuskie Island), no attempt has been made to reroof any ruined tabby structure in Beaufort County. The experiment has been tried with success at Kingsley Plantation, Florida.

37. Prior to excavation the site was densely overgrown. Large trees were felled under supervision or removed by us, and smaller shrubs removed, care being taken not to disturb root systems penetrating tabby. Roots showing signs of renewal were either cut out by hand or, if all else failed, killed with biocides.

38. At the Edwards House, Spring Island, the current owner decided not to follow recommendations regarding capping procedures, preferring to maintain the contours of eroded tabby wall surfaces.

39. Similar mixes were used to repair eroded tabby brick except that crushed oyster shell was substituted for whole oyster shell in accordance with historic precedent. After ten years weathering, extensively repaired tabby brick of the kitchen chimney at the Sams House site appears in excellent condition.

40. Throughout Beaufort County, two-coat exterior finish stucco seems to have been the norm for all categories of tabby building, the final coat being scored in imitation of stonework. There is some evidence that the final external coat was occasionally burnished and painted to further simulate ashlar. On interior faces tabby was usually plastered, the plaster being directly applied to the tabby. One exception is the Saltus/Habersham House, where plaster was applied to lath nailed over battens. Timber wainscoting was a common treatment in domestic structures; full paneling (in pine and cypress) survives at the Barnwell Gough House and Tabby Manse. There are indications that certain rooms were also fully paneled at the Edwards House, Spring Island, and Sams House, Dataw Island.

41. On Callawassie Island, private owners have broken up large tabby chimney bases belonging to a substantial early nineteenth-century house partially excavated in 1983 when the island was owned by Three Fountain View Development Company. The tabby is now used in a rock garden.

Handle With Care
Tabby Is No Ordinary Concrete

Lauren B. Sickels-Taves

The restoration of the Tabby House on Cumberland Island, Georgia, for the National Park Service was over five years in the making. It was not entered into lightly, and tabby's uniqueness did not guarantee that my extensive background on masonry and mortars was viable. In fact, nothing was assumed. Tabby, a vernacular building material, required a sensitive and focused study first, prior to the actual restoration.[1]

It began with a grant-funded survey of tabby sites, more than 250 in all.[2] Sites were examined from the foundation up, looking at different characteristics such as shell placement, texture, composition, manufacturing and construction techniques, color, and unique features as well as size, function, and location. Historical research was undertaken to determine dates and clarify patterns emerging from the survey data.[3] Nomenclature was developed to classify tabby based on these patterns and to simplify future discussions. Briefly, "Oglethorpe Tabby" defines tabby constructed before c. 1795; "Spalding Tabby" refers to tabby erected between c. 1795 and 1870; "Tabby Revival" corresponds to tabby construction between 1870 and 1925; and "Pseudo Tabby" applies to tabby constructed and used since c. 1950.[4] This intense study also included the reconstruction of two lime ricks, or disposable kilns, to understand the lime manufacturing process.[5]

Testing

Samples of tabby were taken into the laboratory and analyzed chemically and physically, undergoing a battery of tests. Modern equivalents were made by either precisely duplicating historic tabby or slightly modifying the ingredients and proportions. Old and new tabby alike underwent American Society for Testing and Materials (ASTM)–quality tests to determine and compare their compressive strengths, adhesion and absorption rates, porosity, specific gravity, void ratios, X-ray Fluorescence (XRF), and hydro/salt capabilities.

The latter test involved running tabby through a series of wet/dry cycles employing salt water. The object was to mimic the conditions in which certain tabby foundations are subject to tidal movement and to assess their durability.

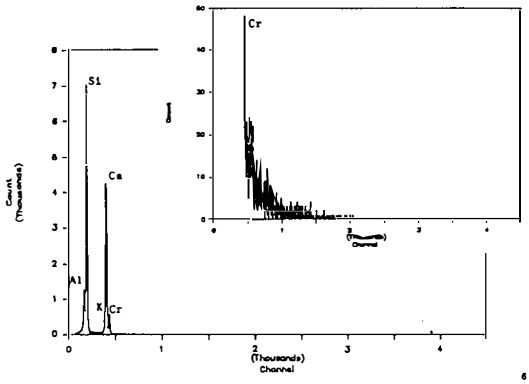


Figure 2a: PIXE
Tabby c.1820

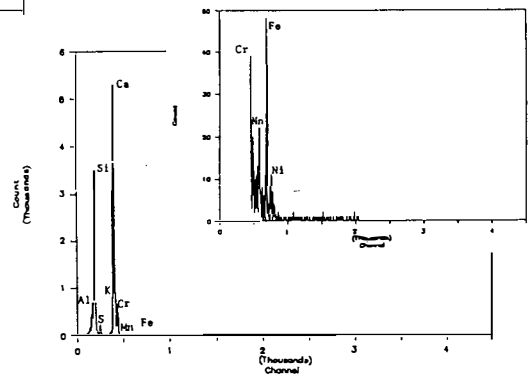


Figure 2b: PIXE
Tabby c.1880

Taken from Lauren B. Sickels-Taves, Michael S. Sheehan, and Gary White, "Applications of Qualitative Trace Element Analyses: An Interdisciplinary Approach to Materials Conservation," Materials Issues in Art and Archaeology 5, Materials Research Society Proceedings 462 (1997): 328.

The three most outstanding tests—most useful in preparing the Tabby House for restoration—were particle-induced X-ray emission (PIXE), computer-assisted optical stereology, and ash analysis.

PIXE uses a charged ion beam, typically protons, to induce target atoms to emit X-rays.[6] The energy required to cause X-ray emission varies among different elements. Analyzing X-ray emissions, and the energy levels at which they occur, allows the chemical elements in the target sample to be identified. PIXE is extremely useful because it can provide information about chemical composition across a wide range of elements, even those present in extremely low concentrations, simultaneously.

PIXE revealed clear differences in the chemical constituency of Spalding Tabby and Tabby Revival tabby. Aluminum (Al), silicon (Si), and calcium (Ca) are expected in both samples, given that these elements are common in lime, sand, and oyster shell. The presence of potassium (K) corresponds to the wood ash found in Spalding Tabby, while its later occurrence marks an element in the portland cement used in Tabby Revival tabby. Although the levels of potassium in these samples are approximately the same, they could not have come from the same source. Portland cement was not available when "Spalding Tabby" was popular. Similarly, the introduction of portland cement and lime in a bag negated the need for the use of lime made from burned oyster shells. The high levels of iron (Fe) and manganese (Mn) found in portland cement are typical of cement products, and perhaps more importantly, are NOT typical of hydrated lime products.[7]

Computer-assisted optical stereology took PIXE one step further and permitted identification of the source of sand used in the construction of the Tabby House.[8] The methodology focused on controlled comparison, using computer software de-

signed to measure size and shape parameters, of objects displayed on a computer screen. A series of sand samples was examined with the intent of matching the size and shape of sand grains from historic tabby to reference samples whose point of origin, namely dune, channel, beach, and pit sand, was known. The results of this study indicated that sand used to produce the tabby of the Tabby House was obtained from sand deposits on the channel side of Cumberland Island. Interestingly, this result is not consistent with the historical literature that suggests that sand used in tabby production was derived from pits excavated near the construction site.[9]

Ash analysis was the by-product of a variety of chemical tests. The knowledge gained from actually building and burning a lime rick to the initial chemical analysis of tabby provided the clue to the accidental inclusion, yet ultimately vital component, of ash in tabby manufacture. The ancient Romans wrote of the hydraulic strength qualities of ash and used it frequently.[10] Military men such as Oglethorpe were well acquainted with the literature of the day and knew of these early treatises, thus made no effort to prevent the by-product of ash from mixing with the lime.[11] In tabby, it increased adhesion, flexural strength, and plasticity and reduced cracking.

The cumulative data from all tests, both in the field and laboratory, produced staggering results and positively confirmed that guidelines for a compatible recipe had been found. It is important to note that in historic preservation, every restoration project should be evaluated independently; this process is particularly important for tabby, for the ingredients vary slightly based on geological location and the age of the structure.

The degree of compatibility between original (historic) tabby and new tabby, created using information generated by the testing program, was significant for a number of physical and chemical properties. The following are examples of this compatibility:

	Original Tabby	New Tabby
Compressive Strength (psi)	350 (poured only)	320.5*
Specific gravity	2.013	2.203

*Harley McKee's preservation rule should be followed: the new material employed should never be stronger than the material to which it adheres.[12]

Current research, unacceptable to preservation purists because a "foreign" material is introduced into the recipe, examines the use of inert glass beads to fill the voids in tabby for the purpose of capping ruins or providing limited weatherproofing.[13]

This wide range of testing was done for the sole purpose of understanding tabby, enabling all future restorations to be reversible and compatible and to match the existing tabby as closely as possible in strength, composition, color, texture, and application.

Formula Determination

Given that tabby's ingredients included quicklime, channel sand, wood ash, oyster shells, and water, the next task was to determine what formula and application were best for the Tabby House.

An extensive testing program was devised that would help identify a recipe, or set of recipes, whose physical properties were compatible with original tabby. Each of six recipes, viewed as legitimate candidates for use in the restoration, was evaluated and the effects of additives, such as microballoons and glass beads, on these physical properties were also taken into consideration prior to the actual restoration. No mix was selected based on superficial examination of older applications in the field.

The formula for original tabby, based on laboratory analysis, was a 1:3 lime:sand with wood ash, obtained during the lime burning, and oyster shell. This specific formula was one of two recommended by the Roman Vitruvius as early as 46–30

The Tabby House, front and rear elevations, nearing completion. The completed walls are drying to a uniform, warm, light brown color (Munsell Colour 10YR 8/1), closely matching the original color. Photographs by Melanie Taves.

B.C.[14] For the Tabby House, a recipe of 1:2:9 white portland cement:hydrated lime:sand was initially selected. The lack of precise duplication of Vitruvius's formula was based on the necessity of retaining a Type O mix with compressive strength similar to that of tabby. The one part portland cement was the estimated quantity needed to duplicate the effects of wood ash in original tabby.

Using wood ash introduced uncontrollable variables in the testing program; thus alternative sources for ash were desirable. White portland cement in small quantities is an acceptable modern equivalent, but it too needs to be carefully controlled due to its density, superior strength, and quick set time. These are actually detrimental qualities that should be avoided in a tabby restoration. Fly ash and man-made additives were eliminated due to their incompatibility or unknown long-term qualities. Additional tests were ultimately run using hydraulic lime as the substitute for wood ash, and again compatible test results were obtained.[15] Given a choice between a breathable lime product and a portland cement in tabby preservation, the lime should win every time.[16] The formula now stood at 1:2:9 hydraulic lime:hydrated lime:sand.

This problematic procedure behind selecting a final formula illustrates the potential inadequacy of taking both historic recommendations and contemporary ASTM standards as a given for use in historic preservation; it stresses the need to look at each project individually.[17]

The sand was located locally and with relative ease. A builder's supply store provided samples of a variety of sand from nearby quarries, and a microscopic analysis determined that Play Sand used in sandboxes perfectly matched the color, size, and texture of the sand found in the historic tabby.

Hydrated lime was also locally obtained, but the hydraulic lime had to be ordered from Riverton, Virginia. It was freshly made for this project and shipped directly to Saint Marys on the mainland. The restoration was ready to begin.

The Tabby House

The Tabby House was constructed in c. 1804 (taxonomically "Spalding Tabby"), probably as part of the antebellum Sea Island cotton plantation, known as Dungeness, owned by Revolutionary War hero Gen. Nathanael Greene and his heirs. When Thomas and Lucy Carnegie purchased Dungeness in 1881, revisions were made to the building. The function changed from a residence to a business office for the plantation manager.

The Tabby House measures forty-four by twenty feet and is made of tabby. The one-story structure has a gabled, wood-shingled roof containing four dormer windows, two in the front and two in the rear. It features a central chimney, also made of tabby. Two doors are at the front. Originally, there were also two doors at the rear, but these were converted, probably during the Carnegie period, to

windows. The two full-sized windows at the upper level may indicate that there was a functional area at the attic level at one time. The central chimney indicates that there were at least two rooms on the lower level and possibly two in the attic, with fireplaces back to back. There is presently no attic floor. A large vault was installed, and circular stairs accessed upper-level shelving. Along the front is a five-bay porch running the full length of the building. The porch appears to date from the late nineteenth century and is one of the Carnegie modifications.

Today the Tabby House is located within the approximately 250-acre Dungeness Historic District on the southern end of Cumberland Island. It is one of the oldest remaining buildings on the island and is the only one meriting a "national significance" rating.

In the early 1990s this building was "preserved" with a new stucco consisting of neat (or undiluted) cement. Within only a few years, the inappropriateness of this recipe became evident. Buckling walls, unsightly staining, and cracks on the exterior with mold, mildew, and peeling paint on the interior forced the National Park Service to install a twenty-four-hour, seven-day fan merely to circulate air until the funds and correct method of preservation could be found. Breaking through the cement stucco also yielded the horrific site of an expandable masonry mesh nailed to the tabby prior to the cement application. This may have kept the cement from bonding directly with the porous tabby, but it was held in place with an unnecessarily high quantity of nails.

Working closely with Jennifer Bjork of the National Park Service, the author sought and obtained funding through Earthwatch, and in June 1997 work commenced. The U.S. Navy donated a barge to move most materials from the mainland to the island.

Initially crowbars were used gently to pry the cement stucco off. This method proved ineffective, and saws were ultimately used to cut and remove large panels. Though the saw made shallow cuts in the tabby, it preserved more of the tabby, and, significantly, the lines served as adhesion points for the new stucco. With the final removal of this stucco, two additional problems were noted: First, the nails in the mesh had sheared the corners off the building and around windows and doors; and second, the moisture entrapped behind the cement had effectively rotted many lintels and sills.

As all nails and other foreign objects were being removed and the walls gently washed with a pressure hose, test panels of the new recipe were being made. Specific consideration was given to matching the existing color and texture. While the sand largely serves as the coloring agent, modifications can be made by slightly altering the quantities of hydrated and hydraulic limes. On-site research required this determination, and the final stucco recipe was 1:1:4 hydrated lime:hydraulic lime:Play Sand mix. (All modifications were compared against the laboratory data to ensure continuity of physical properties.) Where portions of the tabby wall came away with the mesh, this formula was used with oyster shells to rebuild corners. Interestingly, the final recipe was the 1:2 lime:sand cited by Vitruvius if sea sand was used. The Play Sand closely replicated the channel sea sand originally employed.

The technique used to restucco the Tabby House was based on traditional methods. From the start, this project's goal was to replicate as much of the original as possible. First, large holes were filled as in spackling. At every step, the immediate area was wet prior to throwing the tabby. To produce a level finish, furring strips sectioned off the wall. Missing corners were remolded with large furring strips and filled with the new tabby stucco. After the scratch coat application, the strips were removed and filled, and the entire structure was given a final skim coat.

During each step of this two-coat process, the tabby stucco was allowed to harden slowly over one or two days. It was checked hourly. Upon the comple-

tion of each wall, burlap was hung and misted with a hose regularly to minimize shrinkage, slow the drying process, and retain color.

Every step was photographically documented. With its repair completed in one month, the Tabby House now stands as an example of a restoration where the building material was fully understood in every aspect *before* the physical restoration began. All aspects of historic preservation were employed here: The work is reversible without detriment, as with the neat cement, and is compatible with the original in strength, composition, color, texture, and application.

A foundation check also produced evidence that the building might originally have been surrounded by oyster shell trenches to minimize tabby deterioration near the ground. To date, the tabby is wicking properly after rains, but trenches would extend the life of the stucco.

The Tabby House project also generated some new information on lime ricks undertaken by colleague and archaeologist Dr. Michael Sheehan. Historical documents cite these ricks to be as large as a freight car. While the house was under restoration, limited subsurface testing, in the form of soil coring and probing, was undertaken nearby to verify the presence of a lime midden, the term given to the hole after the bulk of the lime from the rick has been removed. Remote sensing, specifically infrared aerial photography, and extensive surface surveys were initially used to locate the potential presence of a lime midden prior to coring. While the archaeology was limited, within three hundred yards of the Tabby House, the numerous cores formed a pattern that closely resembles the shape and size of a freight car.[18]

Conclusion

Historic preservation work requires that the method—be it restoration, rehabilitation, preservation, conservation, etc.—be reversible and not damage the original material. Consequently, all work must incorporate the use of new materials that are similar and compatible with those being repaired.

Although tabby is a form of masonry and perhaps is the forerunner to the later concrete used to imitate it, it cannot be restored like other masonry. The oyster shell lime, for example, is obsolete; so is the wood ash. Tabby is a unique building material and must be treated as such. Success comes only with a full understanding of it. Handle with care: It is no ordinary concrete.

Notes

1. Lauren B. Sickels-Taves, "Vernacular Houses: Tabby," *Old House Journal* 23, no. 2 (1995): 108; Lauren B. Sickels-Taves, "Understanding Historic Tabby Structures: Their History, Preservation, and Repair," *Association for Preservation Technology Bulletin* 28, no. 2 (1997): 22–29.

2. Lauren B. Sickels-Taves, "An Interpretive and Preservation Study of Coastal Tabby," on file at Georgia Historical Society, Savannah, 1994.

3. Lauren B. Sickels-Taves and Michael S. Sheehan, *The Lost Art of Tabby Redefined: Preserving Oglethorpe's Architectural Legacy* (Biohistory International, Raleigh, N.C.), n.d.

4. Lauren B. Sickels-Taves, "Tabby: From Rectangles to Anchors and Octagons" (videocassette), Georgia Historical Society, 1995; Lauren B. Sickels-Taves, Michael S. Sheehan, and Gary White, "Applications of Qualitative Trace Element Analyses: An Interdisciplinary Approach to Materials Conservation," *Materials Issues in Art and Archaeology V*, Materials Research Society Proceedings 462 (1997), 323–30.

5. Lauren B. Sickels-Taves, "Southern Coastal Lime-Burning," *CRM Bulletin* 19, no. 1 (1996): 22–25.

6. Sickels-Taves et al., "Applications of Qualitative Trace Element Analyses."

7. Ibid., 326.

8. Lauren B. Sickels-Taves, Michael S. Sheehan, and Irwin Rovner, "Computer-Assisted Optical Stereology in Historic Preservation: Tabby, a Case Study," *Association for Preservation Technology Bulletin* 28 (1997): 30–33.

9. Thomas Spalding, "On the mode of Constructing Tabby Buildings, and the propriety of improving our plantations in a permanent manner," *The Southern Agriculturist* 3, no. 12 (1830), 617–24.

10. Mark Goodman, personal communication, 28 January 1998.

11. Sickels-Taves and Sheehan, *The Lost Art of Tabby Redefined*, chap. 1.

12. Harley J. McKee, *Introduction to Early American Masonry: Stone, Brick, Mortar and Plaster* (Washington, D.C.: National Trust, 1973).

13. Lauren B. Sickels-Taves and Michael S. Sheehan, "A Strategy for Mimicking Voids in Historic Masonry," *Journal of Testing and Evaluation* 26 (July 1998): 393-95.

14. Vitruvius [Marcus Vitruvius Pollio], *The Ten Books of Architecture*, trans. Morris H. Morgan (New York: Dover Publications, 1960), 45.

15. Sickels-Taves and Sheehan, *The Lost Art of Tabby Redefined.*

16. Lauren B. Sickels-Taves, "Selecting mortar for historic preservation projects," *Masonry Construction* 10, no. 10 (1997): 533–57.

17. International Symposium on the Use of and Need for Preservation Standards in Architectural Conservation, American Society for Testing and Materials (ASTM), Atlanta, Georgia, April 18–19, 1998.

18. Michael S. Sheehan, Lauren B. Sickels-Taves, and Jennifer L. Bjork, "The Lime Middens of Cumberland Island," *CRM Bulletin*, in press, April 1999.

Conclusions

ElizaBeth A. Bede, Compiler

The modern highways have made accessible the arresting loveliness of tabby ruins of plantation buildings overgrown with wildwood. . . . this kind of concrete building [was employed] for every purpose, from tiny dairies of a few hundred cubic feet in size to great mansions and sugar manufactories. The structures, new and at the height of their use a century ago, are now only a "curious wildness of dismantled crumbling gray walls."

Maramaduke Floyd
"Certain Tabby Ruins on the Georgia
Georgia's Disputed Ruins, 1937

While not all tabby ruins along the southeastern seaboard of the United States are presently "crumbling gray walls," they are in critical need of preservation. The tabby structures of this area comprise an irreplaceable cultural heritage. They offer a glimpse into a way of life in previous centuries and are examples of the diffusion of Spanish and British culture in the region. In addition, their fabric contains information about tabby itself, a little-studied building material, and about premodern construction techniques. Unfortunately, this tactile resource has long been undervalued and neglected and is rapidly vanishing.

Pimary goals of the symposium were to assess the current state of knowledge about tabby and to determine information, research, and education needs. The symposium provided an avenue for preservationists, historians, architects, conservators, contractors, engineers, geographers, conservation scientists, landscape architects, and archaeologists to identify and explore pertinent issues and develop priorities for future research. They recognized that the establishment of research priorities was the essential first step towards the development of a more responsible preservation plan for tabby structures. The intent of the research priorities was to identify areas in need of special attention, to suggest methods of collaboration, and to focus future research efforts.

Research priorities generated at the symposium are included in the following categories: historical research, materials characterization, site investigations, preservation plans, and information dissemination. The first three—historical research, materials characterization, and site investigations—form the basis necessary for the formulation of any preservation plan. The plan incorporates such facets as in situ conservation treatments, site interpretation, recommendations for future site use, security, and maintenance. The final category describes potential methods of distributing information culled from the first four categories. This consolidation will expedite the process of developing an understanding of tabby structures and their preservation. The following sections highlight the critical issues identified in each of these five categories.

Historical Research

Historical research is comprised of primary and secondary written, visual, and oral resources. It is invaluable in identifying broad contextual settings as well as providing specific information. Previous historical studies on tabby have been sparse, and numerous issues were identified as requiring rigorous historical research. The primary goals of this research are to determine general and specific construction methods and tabby formulations and also to determine if, and to what extent, parallel, independent, or transferred methods existed on the local, regional, national, and even international levels. Furthermore, an understanding of the genesis of tabby construction and its diffusion and adaptation—geographically, culturally, and chronologically—is necessary to form knowledgeable decisions regarding the treatment and interpretation of tabby structures. To this end, the following outlines the areas in need of further research:

Origins and Historical Diffusion—North Africa, Canary Islands, North America (British, Spanish), and tamped-earth construction.

Spatial Distribution—Southeastern coast (South Carolina, Georgia, Florida), Texas, Caribbean, African; and technology transfer (literature, immigration, traveling artisans, military).

Local Traditions—Eastern United States coast and Caribbean/Africa; British and Spanish; Georgia, Florida, and South Carolina; and James Oglethorpe and Thomas Spalding.

Building Types—Residential, military, outbuildings, commercial, industrial; identification of historical and aesthetic issues, both general and site-specific.

Construction Methods—Construction type and systems (slip-form versus block, size of block over time, curing process for nonhydraulic types, shelter coatings versus exposed tabby surfaces, comparative study with *pisé* [rammed earth] and concrete construction); use (walls; structural components; tie system to roof, floor, and other components, foundations, floors and roofs, other [such as cisterns, benches, stairways].

Tabby Versus Coquina—Spatial distribution, time period of construction, cost factors, building types.

Research generated in these areas will provide an opportunity to evaluate the material and its structures and to develop appropriate preservation treatment plans with increasing clarity. In conjunction with materials characterization and site investigations, historical research will also allow for the evaluation of the relationships between building type, architectural element, composition, location, construction technique, and time period in order to develop a working definition of tabby and tabby structures.

Materials Characterization

Tabby is a man-made material comprised primarily of sand, lime, and shells; however, the proportions of these components and the presence of minor constituents may result in tabby of widely varying physical properties. The minor constituents may range from clay impurities in the lime to additives such as puzzuolanic material, oils, and wood ash.

Lime-based materials are predominantly classified by two major properties, simple or complex systems, and hydraulic or nonhydraulic. Simple systems result in a material that is the same chemical composition as the starting materials. In complex systems, however, new chemical compounds are formed upon setting. Portland cement is an example of a complex material. Hydraulic systems will set in the presence of water. In the humid coastal regions where tabby predominates, this could be an important property. Clays, pozzuolanic (volcanic ash), or fired clay materials (crushed brick, terra-cotta) were often added to masonry materials to impart hydraulic properties.

In general, simple, nonhydraulic

lime-based mixtures are much more susceptible to weathering deterioration mechanisms than complex, hydraulic mixtures containing portland cement. Hydraulic lime-based mixtures fall between the two. Historically, there were also other organic additives used to impart strength to a lime-based mixture. These included linseed and walnut oil, straw, animal glue and hair, sugar, rice, and casein. Field observations have verified the presence of some of these additives in the tabby structures along the southeastern coast of the United States. In addition, the type, size, and orientation of the aggregate—shells and sand in the case of tabby—may affect the physical properties of the mixture.

Preliminary laboratory testing and field observations suggest that tabby formulations run the full range of possibilities. It is important to determine the components and their proportions in order to determine the most appropriate preservation treatment. Simple, nonhydraulic tabby material cannot withstand weathering, and shelter coatings must be reinstituted to insure its preservation. This necessity may also hold true for many of the hydraulic lime-based tabbies. Shelter coats must be chemically compatible with the tabby. It is also necessary to ensure that a shelter coat or any tabby patching material be sacrificial, meaning that it must be weaker in physical properties than the original material. It is, therefore, important not only to determine the chemical and physical properties of the tabby but also of any extant shelter coatings. The initial materials evaluation of tabby should include the following:

Petrographic, microscopic, and wet chemical analysis to determine composition (hydraulic versus non-hydraulic); sand type (grain size, angular versus round, color); binder identification (lime from shells, limestone, commercial mix); minor constituents (wood ash, pozzuolanic material, oils); quantity of water-soluble components; and shell type (whole, crushed, thickness) and orientation.

Physical properties testing to determine strength (compressive and tensile) and porosity/water absorption capabilities.

One goal of materials evaluation is the development of a standard characterization protocol that would allow for classification of tabby based on its pertinent chemical and physical properties, similar to that established for other cementitious materials such as concrete. Possible classifications might include natural (nonhydraulic) versus hydraulic tabby and classification by components. These may form subclasses or comprise their own class: proportions of lime:sand:shell; type of shell (oyster versus other types); whole versus crushed or broken shell; and type of hydraulic component (portland cement, pozzuolanic material, clay impurities). These classifications would allow generalizations and predictions of behavior. They in turn could lead to general preservation procedures for each classification. This type of universal protocol is only feasible, however, after extensive laboratory testing on a wide range of samples.

A second goal of material evaluation and characterization is to determine the most appropriate method of examination for tabby structures. These might range from in situ condition surveys to nondestructive testing to low or high tech laboratory analysis. The development of the most appropriate and universal examination methodology for tabby is necessary not only to insure the preservation of the material but also for comparative analysis.

A third goal is to establish a working definition of tabby. Throughout the symposium, the question was raised: "What constitutes tabby?" Is it the proportions of lime, sand, and shells with water? Is the use of oyster shells significant? Can it be defined by a set of physical and chemical properties? Is it the context, time period, or region in which the material was used? Does the definition of tabby incorporate all of these factors?

The Oxford English Dictionary defines tabby as "a concrete formed of a mixture of lime with shells, gravel or stones in equal proportions, which when dry be-

comes very hard." Because field investigations suggest that not all tabby formulations incorporated equal proportions of ingredients, the symposium participants developed their own basic working definition. The general consensus was that **tabby is a vapor-permeable cementitious material that is lime-based with shell aggregate and sand.** Participants envisioned that the definition would be refined in the future based on the findings of the historical research and materials characterization analysis.

Site Investigations (Coordinated Survey of Extant Structures)

The development of a plan for the preservation of tabby structures must grow out of an understanding not only of the historical context and intimate knowledge of the physical attributes of the material but also from a systematic survey of the structures themselves and their sites. While condition and site surveys have been conducted in the past on a case-by-case basis, the recording methods have varied, and, in general, information is not readily accessible. A standardized survey form, housed permanently in one or several designated locations, would facilitate dissemination of information and comparative studies. The standard form would be expandable to allow future surveys. The general format is envisioned to be similar to the survey forms presently utilized by Save Outdoor Sculpture! (SOS!) for assessing outdoor sculpture. The format would include sections for site history, condition assessment, photo-documentation, and treatment history. Previous condition reports should be used in developing this form and their information incorporated into the new surveys.

The collection of previous reports on tabby structures and the development of the standard survey form would be most useful as a coordinated effort among the Georgia, South Carolina, and Florida State Historic Preservation Offices. The establishment of at least one document depository for the information collected on tabby structures in the United States is also suggested. Following the identification and survey of extant structures, a second phase might be conducted that would focus on an archaeological investigation of extant and previously existing tabby sites.

The surveys would be used to determine the number and condition of surviving tabby structures and could, therefore, assist in developing a prioritized list for intervention. The survey would also indicate the tracking of projects, site management, and the effectiveness of treatments and provide the foundation for future preservation decisions. Finally the survey forms will provide a crucial database to facilitate scholarly comparative analysis, identification of potential thematic studies, and the preparation of historic designation and funding applications on the local, regional, state, and national levels. As dictated by historical research, the survey may be extended to international tabby sites, perhaps in the Caribbean and Africa.

Developing A Preservation Plan

Tabby structures provide a rare glimpse into an adapted premodern building tradition. Sadly, the physical resource of extant tabby structures is rapidly diminishing. It is critical that an appropriate preservation plan be developed and implemented in order to save these vanishing resources. A preservation plan would be an outgrowth of historical, laboratory, and field research.

Since the completion of the various research phases will take time, symposium participants recognized that there are several site-specific issues that demand attention. These include improvement/implementation of drainage systems; vegetation

and biological growth control; reapplication/maintenance of sacrificial shelter coatings (stucco, lime wash, plaster); patching and filling; site interpretation (history, context within the tabby construction chronology); and recommendations for appropriate site use.

As is crucial for all preservation undertakings, treatments used on tabby structures should be reversible and/or sacrificial whenever possible, and new materials and features distinguishable from the original. Full written and photographic documentation of conditions before and after treatments must be kept. All treatments should incorporate provisions for long-term maintenance.

Recommendations for site interpretation and use will vary depending on the classification of the structure, location, and the public/private status of the property. For example, ruins within the public domain can provide an excellent opportunity to educate the public about tabby, and they can be interpreted within the context of other tabby sites. Imprints left within the tabby by joists and sills provide visual tools to interpret construction methods. Because of the fragility of the material, controlled access is recommended for all sites within the public domain.

Existing tabby structures were classified into three categories: extant structures, near complete structures, and ruins. In addition to previously mentioned preservation treatments, the following were identified as additional considerations for each classification:

Extant Structures—Ensure the structural integrity of foundations, lintels, sills, and other supports; and carefully consider load redistribution.

Near-complete Structures—Carefully consider the options of reconstruction; structural reintegration (reinstitution of roof and structural members) and/or bracing; and maintain extant condition.

Ruins—Cap; construct temporary or permanent shelters; reintegrate structural members and/or brace; and preserve construction data (impressions of floor joists, window moldings).

For ruins stabilization, it was suggested that analogous procedures for rubble-wall and adobe structures be consulted, evaluated, and adapted as deemed appropriate.

Disseminating Information

Coordination and dissemination of information is crucial to facilitating a deeper understanding of and developing a preservation plan for tabby resources. Information about tabby should be directed toward a wide audience that encompasses practitioners, clients, site managers, academic institutions, and the general public. Disseminating information about this lesser-known and little-understood material will enhance the interpretation, education, preservation, and appreciation of tabby structures. Dissemination not only aids in avoiding a duplication of efforts but can also identify areas where further research is necessary.

Since accessibility of information to the appropriate audience is essential to the long-term preservation of the material, the following have been identified as initial mediums:

- Forming a committee on tabby
- Generating a mailing list of interested parties, property owners, and site managers
- Specifying an agency or organization as the primary contact source for tabby information
- Developing a tabby Web site
- Producing a National Park Service Preservation Brief or similar publication
- Administering a "tabby newsletter"

• Establishing an information warehouse (perhaps in the Georgia, Florida, or South Carolina SHPO office or at NCPTT)

• Publishing general and technical articles in publications such as *Old House Journal, Historic Preservation, APT Bulletin, AIC Journal)*

• Implementing peer-reviewed publications

• Initiating cultural heritage tourism pamphlets, videos, and interpretive tours

• Presenting lectures at local historic commissions and societies

• Formulating regional publications

• Hosting periodic symposiums

• Circulating curriculum material to academic institutions

• Identifying key partnerships for possible funding of research and projects

• Funding a position for coordination of efforts

Conclusions

The objectives of these research priorities are threefold: to facilitate an understanding of tabby, to develop a suite of methods for assessing levels of deterioration, and to cultivate a plan for future interventions. Towards this end, the symposium participants identified the topics in critical need of additional information to broaden the knowledge base for more productive work and appropriate preservation endeavors. Furthermore, the participants strove to pinpoint areas where additional resources are necessary and suggest the means and methods of marshaling these resources. The culmination of all these efforts is intended to recommend methods to better manage tabby sites.

In his concluding remarks at the symposium, Mark Edwards, Georgia's state historic preservation officer, reminded participants that the development of a preservation plan for tabby resources is a long-term process, but as is true for any journey, it begins only by taking the first step. This symposium and the research priorities generated are that first step—not only towards preserving tabby sites but also towards gaining public recognition of this invaluable resource.

Contributors

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Colin H. Brooker, of Brooker Architectural Design Consultants, Beaufort, South Carolina, heads a small consortium of specialists engaged in the excavation, recording, conservation, and publication of historic architectural and archaeological resources. He trained as an architect in England, later undertaking graduate work at the University of Pennsylvania. He was appointed senior lecturer in architecture at Thames University, London University, and the School of Architecture, Canterbury, Kent. During the 1970s, he worked as a UNESCO conservation expert and was attached to the Jordanian Department of Antiquities as architect/advisor for the Petra/Jerash National Park Project. Mr. Brooker has led several archaeological expeditions to south Jordan. Today, his practice is largely oriented towards historic structures of the southeastern United States, with tabby building as a particular interest. Completed schemes include stabilization of tabby-built plantation assemblages located on the South Carolina islands of Dataw, Spring, Daufuskie, Callawassie, and Hilton Head together with restoration of the c. 1780 Barnwell Gough House in Beaufort. Projects in progress include documentation and excavation of two late eighteenth- century merchant residences in Beaufort, both of which featured tall (three-amd-a-half story) tabby construction. A NEH postdoctoral fellowship has allowed field study of related medieval form-cast construction techniques in Andalusia and Morocco.

Mark R. Edwards is director of the Historic Preservation Division, Georgia Department of Natural Resources, and is state historic preservation officer (SHPO). Prior to coming to Atlanta, he was chief programs administrator and deputy SHPO for the Maryland Historical Trust and deputy director for the Division of Historical and Cultural Programs, Department of Housing and Community Development. He received his B.A. degree in history from Lafayette College in Easton, Pennsylvania, and his M.S. degree

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Dan Elswick serves as the historic architecture consultant for the South Carolina Department of Archives and History and State Historic Preservation Office. He has a bachelor's degree in architecture from the University of Tennessee and a master of architecture degree from the University of Texas. Mr. Elswick has worked in the historic preservation field since 1978. He joined the Texas Historical Commission in 1982 and has reviewed proposals for work on historic properties over the last sixteen years. He joined the South Carolina SHPO office in 1986. Mr. Elswick's interest in tabby was renewed while touring the Habersham House in Beaufort as a potential tax project. That three-story federal residence illustrates the inherent strengths and weaknesses of tabby as a building material.

Thomas H. Eubanks, Ph.D., is state archaeologist and director of the Division of Archaeology in Louisiana's Office of Cultural Development. He received his B.A. degree in anthropology from Eastern Kentucky University. He then accepted the position as assistant to the state archaeologist of Georgia. During his tenure, he played a critical role in formulating state policies for the protection of archaeological resources. He also had the opportunity to participate in archaeological research at a number of prehistoric and historic sites, including the Sapelo Island shell ring. Dr. Eubanks is a historic archaeologist, specializing in the plantation period of the southern United States and Caribbean. He received his M.A. and Ph.D. degrees from the University of Florida. While there, he studied under the direction of Dr. Charles Fairbanks. During the course of his studies, he excavated the nineteenth-century John Houstoun McIntosh Sugarhouse near Saint Marys, Georgia, and more recently documented and excavated a number of eighteenth- and nineteenth-century sugar factories and rum distilleries on the West Indian Island of Tobago. Before moving to Louisiana, Dr. Eubanks established and directed the Tobago Archaeological Program, a joint undertaking of the Tobago House of Assembly and the University of Florida.

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Walter S. Marder, AIA, is preservation architect for Architectural Preservation Services, Florida Bureau of Historic Preservation and State Historic Preservation Office. He provides technical assistance to the public and reviews preservation planning and construction for conformance to the Secretary of the Interior's *Standards for Rehabilitation.* Mr. Marder has a bachelor of architecture degree from Rensselaer Polytechnic Institute and is currently enrolled in the master of history program at Florida State University. He served as city architect for the city of Wilmington, Delaware, and was acting chief architect in the United State Peace Corps in Belmopan, Belize. He is a member of the faculty of the Florida Division of Recreation and Parks Ranger Training Academy and a board member of the Havana Institute for Preservation Training.

Lee Meyer, AIA, is the founder of Meyer & Heitmann, Architects, established in 1965. He has over thirty-two years' experience in the science of building arts, including the preservation and stabilization of historic structures. Mr. Meyer received both his bachelor of architecture and master's in architecture degrees from the University of Florida, Gainesville. He has served on the AIA Committee on Historic Resources and on the City of Savannah Historic Review Board. His work has received various awards, the latest being the national AIA Honor Award for Urban Design for the Savannah College of Art and Design—the City as Campus. Mr. Meyer has been involved in the preservation of tabby on Georgia's coast, most notably in the stabilization of the hospital ruins at Retreat Plantation (Sea Island Golf Course).

Michael A. Miller, AIA, is preservation architect for the Historic Preservation Division, Georgia Department of Natural Resources and State Historic Preservation Office. He provides architectural expertise for the various HPD programs, including federal and state grants, federal and state tax certification projects, Section 106 projects, and technical assistance to other departmental and state offices as well as the general public. Mr. Miller has a B.S. degree in architecture from the Georgia Institute of Technology and a master's degree in architecture from Mississippi State University. He is presently chairman of the Atlanta Historic Resources Committee of the Atlanta Chapter, AIA, and serves on the restoration committee of the Georgia Trust for Historic Preservation.

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Mary F. Striegel, Ph.D., joined the National Center for Preservation Technology and Training in 1995 as research scientist and serves as the center's materials research program manager. She earned her undergraduate degree from the University of Louisville, a master's degree from Purdue University at Indianapolis, and her doctoral degree from Washington University in Saint Louis. Prior to working with NCPTT, Dr. Striegel was a conservation scientist with the Getty Conservation Institute, where her work focused on the conservation of metals. At NCPTT, her chief responsibility is the management of the Materials Research Program, a diverse program of research into the deterioration and conservation of architectural and monumental stones and metals.

Buddy Sullivan is manager of the Sapelo Island Estuarine Research Reserve, Georgia Department of Natural Resources. He is also a lecturer and public speaker, specializing in topics related to coastal Georgia history, including maritime and commercial history, tidewater rice cultivation in the 1800s, Spanish missions, and the nineteenth-century timbering era. He is instructor for adult education courses in coastal history for the Coastal Museum on Saint Simons Island. Mr. Sullivan earned his B.A. in history from LaGrange College, LaGrange, Georgia. He is a member of the board of curators of the Georgia Historical Society, president of the Lower Altamaha Historical Society in Darien, and a member of the board of directors of the Richmond Hill Historical Society. In addition, he has written various articles and books on Georgia's coastal history. Mr. Sullivan's responsibilities include managing the tabby resources remaining on Sapelo Island.

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