Port of Call

NEVER UNDERESTIMATE THE POWER OF DEEP-WATER DREAMS

BY DANNY MARC SAMUELS

Houston, a city founded in a swamp, has always harbored deep-water ambitions. Even though it's 50 miles distant from the nearest lapping waves of warm Gulf salt water, Houston's founders and fathers always dreamed of it primarily as a port city. And strangely enough, despite being situated in the least auspicious of locations, through political persistence, geographic fortuity, and a few turns of historical happenstance, Houston did eventually become a successful deep-water port, the sixth largest in the world and, in the U.S., first in foreign waterborne tonnage and second in total tonnage. The port and its associated industrial zone, providing trade connections around the world, are the engines that drive Houston's prosperity.

Economic success, however, comes at a cost. Making the port has involved recurrent large-scale restructurings of the landscape and alterations to the environment. A port, like a city, keeps eating the land around it to provide newer, more competitive facilities, which by their nature grow larger and larger. Deeper channels for larger ships require constant dredging. Over a hundred years, a natural watershed and salt-mash ecology has been transformed into one of the largest, most productive industrial zones in the world.

All this was not apparent in 1836, when Texas settlers, victorious in their war for independence from Mexico, found themselves in possession of a vast undeveloped territory. East Texas was not a particularly rich land, but there was timber to the northeast, soil of adequate fertility to support cotton, rice, and sugar cane cultivation in the Brazos River valley to the southwest, and a fortuitous opening to the Gulf of Mexico at Galveston Bay. Most of the rivers along the Texas gulf coast are seasonal and shifting, impeded by sandbars, without protected harbors. Galveston was the best natural port along the coast, its bay protected but shallow, flushed by a high volume of water flowing through the narrow Bolivar Channel that kept the passage clear of sandbars. Buffalo Bayou, at least up to Harrisburg, formed a broad channel for navigation.

There was considerable competition then to establish the city that would be the successful trans-shipment point, where ox-wagons could transfer their loads of cotton or lumber to barges or steamers. Then, as now, small differentials in the cost of com-
peting modes of transport made all the difference, and aquatic barges, being cheaper than terrestrial ox-carts, won out. The port should be as far up the bayou as free navigation would permit.

In 1836, brothers Augustus and John Allen, a pair of real-estate promoters, pushed far up Buffalo Bayou to their fourth-preferred site to found their dream city. (Their first three choices — at Galveston, Morgan’s Point, and Harrisburg — turned out to be already taken or tied up in title disputes.) Even though their site — now Houston — was far from ideal, by sheer entrepreneurial audacity the Allen brothers succeeded in making their paper city a reality. But as it turned out, they went a few miles too far up the bayou.

The Allens were so convinced of their venture that in 1837 they hired the 85-foot steamer Laura to make a demonstration voyage up the bayou. Because of sharp bends, sandbars, logs, and overhanging branches, the trip took three days, but their ship nonetheless came in. When skeptics remained unpersuaded, the brothers hired the Constitution, the largest steamer then plying those waters. It made the trip up the bayou, but unfortunately there was no room for it to turn around, and, embarrassingly, it had to be backed down the bayou to a wider area eight miles downstream. This became known as Constitution Bend, and later became the site of the Turning Basin — as far as deep-water ships ever made it toward Houston.

Houston then had to be content with the small, shallow draft ships and barges that could come up the narrow, twisting channels of Buffalo Bayou and turn around, and with being, at the Allen’s political instigation, the (temporary) capital of the new Republic of Texas. Beginning in the 1830s, there were sporadic efforts to improve the navigability of the upper reaches of Buffalo Bayou by deepening and straightening the channel. Allen’s Landing did become a small functioning port, and cotton was loaded right at the bottom of Main Street for shipment to Galveston.

It was Galveston that won the first round of what would become a continuing competition with Houston, and between 1840 and 1900 it became a prosperous and urbane city, the largest in Texas. Cotton was brought to Galveston by barge and loaded onto ocean-going ships moored outside the oyster reefs, bound for the east coast or England. The Strand became the center of cotton export, and new buildings were built with cast-iron parts imported from England on cotton freighters that needed ballast for the return journey to Texas. By 1896, with the support of western states seeking an outlet for their produce, construction of federally funded jeties and dredging to a depth of 25 feet made Galveston a true deep-water port.

With the growth of the railroads in the latter half of the 19th century, Houston’s inland location developed an advantageous potential. Lying along an east-west route from New Orleans to Los Angeles, and along a north-south route from St. Louis to Mexico, Houston became a convergence point for rail shipment. Galveston, on an island 50 miles farther away, was not along a major route, and was only tenuously linked by a single line from Houston that crossed the bay on a low viaduct. Now cotton and other commodities could be shipped by rail from Houston or points west to Galveston at less cost and in half the time needed to barge it down the bayou.

Houstonians did not give up their deep-water dreams, however. The possibility of reducing shipping costs even more by avoiding Galveston entirely drove Houston’s ambition. The Houston congressional delegation kept trying to get the federal government to pay the cost of dredging a deep channel to Houston. Soon the balance shifted to Houston, but it came at an enormous cost to Galveston.

The Great Storm struck Galveston on September 8, 1900. In a natural disaster of unparalleled destruction, more than 6,000 people were killed and large areas of the city were devastated in the storm surge. It took Galveston 15 years to recover and rebuild. The island focused its efforts on building a seawall, raising the grade level of much of the city, and constructing a new railroad viaduct across the bay. With Galveston thus distracted, Houston representatives seized the opportunity to push through Congress a bill to fund the construction of a ship channel, with a compromise provision to rebuild the Port of Galveston.

The construction of the Houston Ship Channel, an enormous engineering project, was begun with federal funds in 1903. The work involved several related parts: first, the dredging of a channel 18.5 feet deep and 100 feet wide for 25 miles north through the shallow waters of Galveston Bay to Morgan’s Point, the mouth of the bayou; second, straightening and widening Buffalo Bayou for another 25 miles, north to Lynchburg, then west to Long Reach; and third, construction of a turning basin large enough for ocean-going ships at Constitution Bend. This work went in fits and starts, but was finally completed by 1914, with the channel depth increased to a depth of 25 feet, sufficient for the latest ocean-going ships. Citing budget and engineering considerations, the Corps of Engineers resolved a local controversy by siting the turning basin eight miles east of downtown Houston. Though the city’s founding dream of deep water had been thwarted, the city’s officials were unshaken. If the deep water would not come to Houston, then Houston would
go to the deep water. It did so by annexing Harrisburg and growing eastward.

Meanwhile, the rebuilt Port of Galveston was one of the most modern facilities in the world, with a 32-foot channel, more than 100 berths, five miles of wharf frontage, and new elevators and warehouses. It recovered quickly, and by 1912 was the second-busiest port (after New York) in the U.S., handling three times more cotton than any other port in the world. But Galveston could not long maintain its lead over Houston. Ultimately, there was simply not enough space along its cramped waterfront for all the services needed for a modern port. Nor could Galveston overcome its disadvantage as a spur to Houston's rail center. The extra cost of shipping to Galveston, known as "the differential," always made its port less competitive than wharves closer to Houston.

So Houston became an international port, connected to the west coast by the Panama Canal (opened in 1915) and to a new system of intercoastal canals along the Gulf coast. The primary cargoes were cotton, fertilizer, lumber from east Texas, and sugar and rice from the coastal plains.

As luck would have it, on January 10, 1901, barely four months after the Great Storm devastated Galveston, and less than 60 miles away, oil gushed out of a hole poked into the ground at Spindletop. There ensued a mad rush for oil, and within a few years fields were discovered all over east, south, and central Texas. World War I demonstrated the utility of the internal-combustion engine and spurred its development, fueling the demand for petroleum products at the same time that new fields were coming on-line all over east Texas.

When the channel made 25 miles of waterfront real estate available along each bank in 1914, Houston's ready access to world markets encouraged oil companies to start building refineries here. Sinclair came in in 1918, followed by Deep Water in 1919, Crown and Humble in 1920, and Shell in 1929. By 1930 there were eight refineries on the ship channel, and pipelines from fields in south and east Texas were converging on the new channel facilities. By 1940, 49 ship channel refineries accounted for 11 percent of the gasoline produced in the U.S.

After a slow time during the Depression, World War II provided the next impetus for industrial development along the ship channel. Steel mills, ordinance plants, and shipyards fed the war machine. Most important, the petroleum industry spawned the petrochemical industry, with new refineries processing raw stocks of petroleum, natural gas, and sulfur to produce new chemical wonders such as butadiene for synthetic rubber, toluene for TNT, and high-quality aviation fuel. This enormous expansion of port industries continued after the war. The petrochemical industry readily converted to the production of myriad plastics to supply an ever-expanding domestic market. Synthetic fibers were developed that supplanted the market for cotton.

To maintain an edge over such competitors as New York, Philadelphia, and New Orleans, the Port of Houston Authority (which was established in 1927) has made major investments in dredging, additional wharves, and new materials handling facilities. If you are serious about having a deep-water port, you have to keep making it deeper and wider as ships get larger. The ship channel has been continually deepened and widened: in 1925 from a depth of 25 feet to 30 feet; in 1935 to a depth of 34 feet and a width of 400 feet; and in 1967 to a depth of 40 feet. Currently it is being dredged to a depth of 45 feet and a width of 330 feet, even though this necessitates replacing numerous pipelines, cables, tunnels, and other under-channel infrastructure. The dredging operations have also created new territory, as millions of cubic yards of spoilage have been placed in diked cells similar to Dutch polders. Some of these areas have been used to build new port facilities; more recently, some have been used to create bird habitats and salt marshes.

The Port of Houston now carries more foreign waterborne tonnage than any other port in the U.S., and with about 194 million tons in 2001, ranks second behind south Louisiana in total tonnage. Counted in tonnage, the Houston port's top trade partners are Mexico, Venezuela, and Saudi Arabia. Counted in dollars, total foreign trade is about $45 billion, with the top trade partners being Mexico, Germany, and Brazil. This growth, along with the development of air conditioning, finally allowed Houston to proclaim itself "a world city."

Despite the Port of Houston's economic importance to the city, for most Houstonians the port is a remote and unexplored territory. This is true of most ports in most cities: even when they are located in the center of a city their operations are not public in nature, and all the interesting stuff is hidden behind walls and buildings. But Houston's port, eight miles removed from downtown and far from the Gulf, has its own unique and unknown territory. In general, it can be seen as comprising three parts: the old port nearest Houston, anchored at the Turning Basin; the petrochemical port spread along the banks of the Houston Ship Channel; and the modern specialty ports, exemplified by the container terminal, which is located close to Galveston Bay for easy access by large ocean-going ships.

A slice through the history of the old port may be obtained from a trip on the MV Sam Houston, the Port Authority's public tour boat. The tour goes from the
Turning Basin to the Loop 610 bridge, pretty much the pre-WW II port. At the head of the Turning Basin is a collection of dormant ships: the derelict Stolt Spirit of Monrovia, a rusting hulk that burned five years ago, and three Navy roll-on/roll-off ships pre-positioned on ready alert to ship military cargo to the next war zone. A little farther down there is the everyday working port for general cargo ships wharved near to warehouses, being loaded or unloaded by item by longshoremen during daylight operations. On a recent day, one could see the Wilson of Dover, Delaware, loading pallets of fertilizer sacks; the Star Elf in of Panama unloading steel pipe onto a dozen waiting flatbeds, with several giant generators nearby on rail cars awaiting the return trip; the North Challenge, also of Panama, taking on petrochemicals by pipe; and the Tai Kang Hai of Tianjin being fed bulk grain through conveyor belts.

Viewed from a distance, the scale of everything is enormous: ships, cranes, silos, warehouses, and bridges are all giant elemental forms. Time moves at an adagio tempo, a deliberate choreography of gantries and ships, nothing too fast. Up close, and low to the water, there is another scale of traffic underfoot, one moving at an allegro pace — tugs chugging back and forth, cranes lifting pallets of goods and produce, barges loading and unloading, trains and trucks moving about.

The next section, below Loop 610, is not readily viewed from the water: 25 miles of channel lined with continuous petrochemical and other large-scale industrial facilities. Glimpses of this surreal landscape may be had from nearby roadways such as the 610 bridge (but don't stop there), Highway 225, Clinton Road, and Texas Highway 146. Here are dozens of petrochemical plants, each the size of a medium city's downtown, with hundreds of towers larger than office buildings, structures without skin, spectacularly lit at night. Houston is the second largest petrochemical complex in the world, refining more than 50 percent of the gasoline used in the U.S. Tankers dock at corporate wharf facilities, unloading their crude cargoes from the Middle East and South and Central America directly into the refineries. The eventual refined products are then distributed around the U.S. by pipeline or railcar, or overseas by tanker. A series of industrial towns — Galena Park, Pasadena, Deer Park, Texas City, Baytown, and La Porte — provide home and support for those who labor in the channel industries.

The third section consists of new specialized facilities, but they are not all in one locale. These facilities exploit new technologies, combining specialized ships and loading equipment, that have completely changed the shipping industry. From the 610 bridge, you can see to the west the roll-on/roll-off — a.k.a. RO/RO — port, where ships from Germany disgorge new Volkswagens directly onto enormous parking lots for shipment to the Midwest. To the east, you can see wharf 32, specially designed and built for transferring heavy, oversized, and irregularly shaped cargoes. At Jacintoport, there is a new cold storage and food distribution facility. Offshore, Ultra Large Crude Carriers and Very Large Crude Carriers, the most economical transporters of bulk crude, but too large for any U.S. port facilities, are offloaded to smaller ships for delivery to port facilities. (Off the coast of Louisiana there is an offshore ship-to-pipeline trans-shipment facility for unloading these behemoths. So far, efforts to construct such an offshore port in Texas waters have not materialized.) But the facility that exemplifies the biggest revolution in shipping is the Container Terminal at Barbour's Cut, where Buffalo Bayou meets Galveston Bay.

On April 26, 1956, when the freighter Ideal X carried the first load of 58 containers — steel boxes eight feet by eight feet by 35 feet — from Newark, New Jersey, to Houston, it was not, on the face of it, a shipping revolution. But the eventual success of this shipping concept transformed not only the shipping industry but the nature of the global economy as well as the character of port cities around the world. When a producer could load a container in a factory anywhere in the world and ship it directly to a consumer anywhere else in the world quickly, at low cost, and in relative security, the whole equation of supply and demand shifted. Every point of production became directly connected to every point of consumption. A new kind of global commerce was born.

Traditional ports, located centrally in the cities they had helped form, were obsolete overnight. As Deyan Sudjic writes in _The Hundred Mile City_, "The teeming gangs of longshoremen, organized with the intricacy of a medieval craft guild to pack each bale and barrel into the hold, became redundant." Even the customary warehouse sheds that formed part of the shipping infrastructure were no longer needed, because the containers were waterproof on their own.

The modern shipping container was the brainchild of Malcolm McLean, a North Carolina trucker, who imagined that a large standardized container — essentially a trailer without wheels — could be carried by ship, rail, and truck and moved easily between them. McLean tried to sell his idea to the major steamship companies, but they weren't interested. So he started his own company, SeaLand, and built specialized ships and equipment to handle shipping between Houston and New York. The cellular containers turned out to have the advantages of strength and lightness, ease and speed of handling and storage, weather protection, and security. A con-
tainer holds five to 20 times the weight or volume that can be lifted with a conventional crane hook. A container ship can be loaded about 20 times faster than a conventional cargo ship, greatly reducing labor costs. Soon, shippers jumped on board.

By 1965, the International Standards Organization decreed standard sizes for containers: ten, 20, 30, and 40 feet in length; eight feet wide; and eight feet tall (raised to eight feet six inches in the '70s). The most common lengths are 20 and 40 feet. In 1967, a worldwide standard for corner castings defined how the containers could be lifted, stacked, and locked into place. The crux of the modern shipping container is the idea that eight corners are defined at given distances. Many different types of containers, shipping racks, and tanks have developed according to those standards. Special ships, rail cars, truck chassis, and cranes have also developed, a system allowing complete intermodal transfer between trucks, trains, and ships. All these components operate together as a huge machine for shipping. Locked inside the container, not apparent to the observer, may be $10 million worth of computer chips — or toxic waste.

Container ships exist, naturally, to carry containers. Unencumbered by interior decks, their holds can accommodate containers stacked eight high and ten wide. The weather deck provides a second cargo area, with containers stacked three to five high and 13 wide. The third generation of container ships, built in the 1980s and scaled to fit through the Panama Canal, were a total of 4,000 feet, a beam of about 100 feet, and a draft of about 40 feet, and could carry up to 7,000 20-foot container equivalents (TEUs) at about 19 knots. Later ship designs, too large to pass through the Panama Canal, are wider, but not longer, and have capacities of up to 6,000 TEUs, at 24 knots.

The global flow of container commerce is based on ships that ply regular routes in the Pacific, the Atlantic, or the Caribbean, according to strict schedules, visiting a limited number of ports that can then distribute the containers efficiently by rail or truck to their ultimate destinations. Ships and terminals represent enormous capital investments, and as with airlines, it is necessary to keep equipment moving constantly and on schedule. Differentials of days, or even hours, can have a huge effect on how containers are routed. These ships don't mess around with the Panama Canal. Cost and time drive everything.

Virtually all cargo from Asia comes to the U.S. in generally larger ships to west coast ports (Seattle, San Francisco/Oakland, Los Angeles/Long Beach, San Diego), and is distributed, partly by rail, partly by truck, to points eastward, all the way to the east coast. It is this commerce that has been crucial in making Asia a producer for the rest of the world. Somewhat smaller ships sail the Atlantic from Europe to ports on the east coast (Boston, New York/ New Jersey, Norfolk, Charleston), and their cargo is likewise trans-shipped westward. Houston is the last port of call on this circuit. But ships from the east coast of Central and South America come to Houston first, and their cargo may be distributed all over the U.S. from here. However, Houston is generally seen as a unique regional port that serves a mostly Texas market. A container going from, say, Germany to St. Louis could be unloaded at Newark or Norfolk and arrive by rail at its destination a week before the same ship would even get to Houston.

The Port of Houston started a container terminal facility at Barbours Cut at Morgan's Point (ironically, one of the natural port locations the Allen Brothers were not able to obtain) with two wharves in 1977. The facility has now grown to six 1,000-foot wharves with marshalling yards covering 250 acres, room for more than 21,000 TEUs. The terminal operates 24 hours a day, seven days a week, and 363 days a year (it's closed Labor Day and Christmas). Ships are routinely turned around in eight to ten hours. At the Houston terminal, about 80 percent of the landside traffic is by truck. The 20 percent that goes by train is generally South and Central American loads bound for the West Coast. Houston handles more than one million TEUs each year.

Driving to the Barbour's Cut Terminal is like following worker bees to the hive. The density of trucks on the roads carrying containers increases until finally they line up in 26 rows at the entrances to the facility, an average of 1,600 in or out each day. Each truck yields its load to a rubber-tired gantry crane, and then drives around to pick up another load for its return trip. The gantry stacks the containers in well ordered rows, six across, four high, and many long, on a paved surface that is, essentially, a parking lot. Usually with no more than two moves (by means of assigned yard trucks that continually scuttle back and forth), they are positioned for loading onto ships, separated for different parts of the hold by destination and weight (heavier containers must be placed lower in the hold). Then in a final move from yard gantry to yard gantry to a truck to hit their next destination. All of this is organized by computer inventory controls, but still takes a spectacular coordination between the yard stevedores and a ship's crew to load a ship as efficiently as possible.

The latest effort to reconfigure the landscape comes as the Barbour's Cut Container Terminal has maximized its capacity, and the Port of Houston Authority looks around for an expansion site. The idea is to keep the existing facility as it is, and begin a new one nearby, with a projected 20 year build-out. The site favored by the Port Authority is located five miles south of Barbour's Cut on Galveston Bay, at Bayport. The facility envisioned has 7,000 feet of berth, with seven wharves, 720 acres of marshalling yard (three times as much as Barbour's Cut), and a cruise ship port. The Port of Houston Authority is promoting this as a must-have facility, necessary to maintain Houston's competitive position relative to other Gulf ports.

According to Port of Houston Authority Chairman James T. Edmonds, "Bayport is the right location for the Port's proposed container and cruise terminal, environmentally, financially, and socially." But the site has proven controversial. Environmental activist Jim Blackburn contends that "Bayport is the wrong project in the wrong place. The Port of Houston is determined to put this square peg in a round hole, and they are spending tremendous amounts of money to this end. The sad thing is that this fight did not have to happen. The environmental community would agree to at least two other locations for a container port on the bay." A study commissioned by Blackburn's group, the Galveston Bay Conservation and Preservation Association, notes that many of the assumptions made in the Corps of Engineers' draft environmental impact statement bias the site selection to Bayport. The Association suggests instead placing the proposed container terminal, stripped of its cruise ship port, on one of two dredge spoilage placement areas: at Shoal Point or Spillman's Island, directly adjacent to the existing Barbour's Cut facility. Edmonds disagrees: "There are a number of practical, and financial, reasons that Spillman's Island cannot be developed at this time, including the fact that it would be an imprudent use of taxpayer money. It is a designated dredge disposal site for the next 50 years and would require tens of millions of dollars, and an unknown number of years, to bring it to a level where it could be developed." Whatever the outcome of this current controversy (and there is little doubt what that might be), it is only an episode in a long process of land restructuring for the purpose of channeling and processing a complex network of solid and liquid material flows. A 50-mile reach of land and water is now dedicated to the commerce and industry that is Houston's raison d'être. This network, as massive as it is, is extraordinarily sensitive to small changes in constraint conditions — distances, modes, costs — that greatly affect the viability and structure of the network. The flow will always occur along the least expensive path. That path, by historical happenstance and entrepreneurial verve, has for the last century flowed through Houston, a city fortuitously founded in the wrong place. But such paths, like the course of a river, can suddenly shift, along with the fortunes of great cities.