

John Gorrie, The Visionary

The First Century of Air Conditioning, Article 1

By John Gladstone

Fellow/Life Member ASHRAE

Dr. John Gorrie of Apalachicola, Fla., is recognized as the first to propose, scientifically discuss, construct and operate a refrigeration machine for comfort cooling.¹ What perhaps began as an attempt to save the lives of a few seamen from malaria and yellow fever altered the living pattern of the civilized world.

Florida in the 19th Century

When John Gorrie arrived in steamy Apalachicola in 1833, there were really two Floridas: East Florida, administered from Saint Augustine, America's first European settlement in 1565, and West Florida, administered from Pensacola, first established by the Spaniards in 1698. Four hundred miles of impenetrable jungle separated the two cities. Travel between them required about 24 days sailing time around the peninsula.

Florida, which had been ceded to the U.S. in 1821, was still a Territory when the young doctor decided to open practice there. The governor of the Territory was William Duval, who had followed Andrew Jackson's brief tenure. "Old Hickory"—a sobriquet attached to Jackson by his many admirers—had first come to the Territory fifteen years earlier when he briefly invaded Spanish Florida to quell the Seminole Indians who were "harrassing" the frontier settlements. This was the period of the First Seminole Wars. After his first year as governor, Jackson moved onto the national scene, becoming the seventh president of the United States in 1829. Old Hickory was in the White House when Dr. John Gorrie hung out his shingle in Apalachicola.

At the end of two-and-a-half centuries of Spanish occupation, Florida was still little more than a frontier military outpost dependent upon an annual subsidy from the Spanish Crown for its survival. But with the ceding to the U.S., growth and commercial development leaped forward.

The first territorial census in 1825 was incomplete and unreliable, but estimates put the population of Apalachicola at 5,780.² The entire population of Florida was about 28,000, with only 317 persons in South Florida and around 20,000 Apalachee and related tribes in the Western panhandle.³

Before the advent of the railroad, city-building in the U.S. took place only along coastal and river ports. Apalachicola is strategically situated on the Bay of Apalachicola and the mouth of the Apalachicola River. An 1837 map shows a well laid-out town with a rationally designed scheme to utilize the prevailing breezes and provide maximum thermal comfort in this



*Dr. John Gorrie,
1802–1855*

semi-tropical climate. Great attention was paid in those days to proper community design of streets and buildings; there was a "natural" approach to working with the environment to achieve comfort and conserve energy.

Before the coming of the railroads in the late 1850s gave the South many inland cotton depots, Apalachicola was the sole outlet for all cotton grown in the Chattahoochee Valley of Georgia and Alabama as well as the Florida panhandle. The second largest seaport in the Gulf, it was by no means a backwoods town by contemporary standards. Tall ships from around the world sailed in and out of this vital cotton port in great numbers; more than 200,000 bales of cotton moved through the port in one year. Summers, it was not unusual to see the port hospital crowded with seamen afflicted with malaria and yellow fever. It was suspected that they were the source of the periodic fever scourges that swept through this semitropical area. In 1840, nearby St. Joseph was ravaged by epidemics of cholera and yellow fever and more than 100 persons died of the fever in Apalachicola in 1841.

About the Author

John Gladstone entered the refrigeration industry in 1938 through the Universal School of Refrigeration. Engineer, teacher, historian, artist and author of 20 books, Gladstone is the historian for ASHRAE's Miami Chapter and serves on the Handbook subcommittee of ASHRAE Technical Committee 5.10, Kitchen Ventilation.



Figure 1: Ice crop on the Hudson; Harper's Weekly, March 7, 1874 (author's collection).

Why Apalachicola?

When Dr. John Gorrie first arrived in Apalachicola, a large segment of Apalachee Indians was still living near the river. But in 1840, the remnants of this once large nation was removed by the federal government and resettled on a western reservation.

Few historians have examined the hybrid nature of antebellum America; its unique ethnic and social mix, its covert miscegenation among black, white and red-skinned people despite the pronunciamientos to the contrary. While capitalism flourished in the North with a diversified economy founded upon industry, manufacturing, commerce, agriculture, finance and a free, wages-based labor market, the mode of production in the South was slavery based on the "plantation system," mainly agricultural with labor provided by slaves held as private property. Florida, not yet a state, strongly favored slave holding and though she gained statehood in 1845 while Dr. John Gorrie was mayor of Apalachicola, she left the Union in 1861, a secessionist State.

Why did John Gorrie come to Florida? Why did this young, exceptionally talented and well-educated doctor, who had taken his training in New York and first practiced in his hometown of Charleston, S.C., decide to settle in Apalachicola? Charleston, later the scene of the precipitating act of the Civil War, was one of the most important and cultured cities of the Union. It had everything to offer a handsome young doctor who was accustomed to wearing "velvet trousers and an embroidered waistcoat, buckled shoes, and lace cuffs [with] a coat that came from Paris and fitted him like a glove."⁴

Very little reliable information about this remarkable American is available to researchers, but what is known about him leads us to the assumption that his main motivation to practice medicine in Apalachicola was caring for patients suffering from malaria and yellow fever. Another clue may perhaps lie in his close association with Dr. Alvin Wentworth Chapman. Chapman, a Yankee from Southampton, Mass., came to Apalachicola six years after Gorrie. They became best friends. After graduating from Amherst with honors, Chapman set up practice in Apalachicola because, "I wished to escape the 'blue' Presbyterianism, predestination, damnation and all the rest that made life, particularly the Sabbaths, miserable" in New England.⁵

Background and Education

The early history of John Gorrie is shrouded in mystery. Like that more famous American, Alexander Hamilton, he was born on St. Nevis in the West Indies, and like Hamilton, his father was of Scottish descent. His mother, however, as one story goes, was a young Spanish beauty who fled Spain with the middle-aged Captain Gorrie at the turn of the century. When political problems broke out in St. Nevis, Gorrie brought his young wife and baby son to Charleston for safety. Some reports have it that John was actually born in Charleston after his pregnant mother arrived from St. Nevis. At the time, 1803 to 1804, the U.S. population was about 5.5 million—less than one-half the number now living in Florida. Thomas Jefferson was president. Waterpower was the major source of energy.

After settling his wife, Captain Gorrie returned immediately to St. Nevis and John never saw his father again. But monthly remittances arrived from St. Nevis, and mother and son lived without want. The young Gorrie attended the finest private schools in Charleston.

In his early twenties, Gorrie attended the College of Physicians and Surgeons of the Western District of New York, popularly called the Fairfield Medical School, and earned his Doctor of Medicine at the age of 24. He returned, after his graduation, to Charleston, home of his mother, but moved to Abbeville after her death. It was in Abbeville that he came to know the son of John C. Calhoun and through him, the famous man himself. Gorrie became a regular guest at the Calhoun house and undoubtedly some of Calhoun's democratic spirit—as well as his slave-holding philosophy—colored the young physician's political views.

The commercial history of Apalachicola begins just around the time Gorrie established his residence there. The bank of Apalachicola incorporates in 1839 (capital, \$500,000). Two newspapers, *The Gazette*, and *The Currier*, are published that year. The first racetrack in Florida is opened, and many elegant homes are constructed in Apalachicola and nearby St. Joseph. But they build no manufactories here. The desperate resistance of Northern craftsman to subjection by the machine in those early throes of the Industrial Revolution does not stir the agricultural South where King Cotton reigns.

It is axiomatic that mechanical invention will flourish naturally in technological environments where the demand for creative pursuit is high and where the inventor has ready access to sophisticated tools, skilled labor and well-outfitted job-shops in which to fashion working models. It comes as a surprise, therefore, to see a high-tech invention originate in a slave-holding, retrograde agricultural society. Even more remarkable is Gorrie's *catalogue raisonne*.

Man of Many Talents

John Gorrie was a true Renaissance man. One year after his arrival in Apalachicola, the young physician-scientist was appointed postmaster—"salary \$131.20 per annum." He became mayor in 1837. Physician, physicist and inventor, he served also at various times as city councilman, treasurer and president of the Branch Bank of Pensacola. He was one of the first doctors to practice in the U.S. Marine Hospital system—today the Public Health Service—and developed many of the principles of public hospital administration. He supervised the draining of swamps around the bustling port city, and during his term as mayor he recommended a plan for a city hospital for poor and needy patients. He was responsible for the first ordinance requiring inspection of the city market by the city marshal, avoiding rotting meat and fish and overripe fruit. All this activity notwithstanding, the good doctor made time to become the founder of Trinity Church of Apalachicola.

The *Journal of the American Medical Association* had this to say about him in 1893: "Gorrie is said to have been one of the foremost practitioners in the South in his day, and to have made many valuable contributions to the medical literature...the entire country should be interested in securing for this devoted physician and neglected inventor the distinction he deserves as a scientific student of medical problems, working for the benefit of his patients and devising a great sanitary invention calculated to be of ever-increasing benefit to humanity."⁶

Gorrie's dedication to community affairs and time-consuming civic duties notwithstanding, he was constantly performing scientific experiments. Thoroughly familiar with the work of Cullen, Faraday and Perkins, his investigations into cold led him to conclude that ice was a "reservoir of electricity," essential to his patients' health. He was convinced that he could save the lives of his dying malaria patients if only he could reduce the room temperature in his hospital. As early as 1842, he built

his own galvanometer to measure the connection between electrical current and blood flow.⁷

Searching for a Cure

Malaria, Dr. Gorrie believed, was a vapor, and that somehow there was a connection between this vapor and the swamp. He was unknowingly in hot pursuit of the mosquito. Mosquitoes were a dreadful nuisance in tropical Florida and caused much suffering, particularly to sedentary patients who were defenseless against the critters. To protect patients from these terrible insects, gauze curtains were hung around the patients' beds. These curtains were thought "to be sifters of the atmosphere and decomposers of the fevers" and that they had a neutralizing effect on the vapors of the swamp.⁸ Atmospheric impurities were ever present in Gorrie's mind. He believed all diseases stem from three principle causes; atmospheric impurities, con-

tagion and debauchery. "Debauchery" meant overeating and overdrinking, and these excesses reduced the body's resistance to diseases. Though malaria was called "summer sickness," the connection between the mosquito and the prevalence of the insect in summertime had not yet been made.

In an 1841 account of Dr. Gorrie's visit to investigate the deaths from yellow fever in St. Joseph, one newspaper wrote; "Dr. Gorrie brought with him from that place (St. Joseph) a list of 27 deaths, 20 of them in eight days, and we have heard of six more since his arrival."⁹ That summer, 47 persons died in Apalachicola. It was said that there were "ghost ships adrift in the Atlantic with a cargo of dead men aboard—

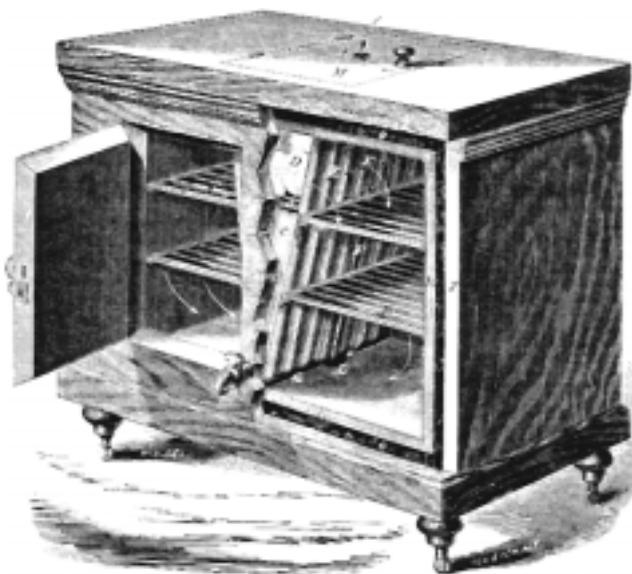


Figure 2: Bartlett's "improved refrigerator;" *Scientific America*, March 15, 1859 (author's collection).

dead from the fevers."

As early as 1842, Gorrie devised an air-conditioning system to treat his fever-stricken sailors by blowing air over buckets of imported ice into the sickrooms. No description of the air-blowing mechanism has thus far been discovered. In the age before electrical power (Thomas Edison's first electrical power plant in the world opened in 1882 on Pearl Street, New York City). Was the "blower" steam driven, manually operated by a slave, or was some kind of wind sail or wind scoop used? Ice in those years was delivered to the Gulf ports by sailing ships out of Boston and New York where it was harvested from northern lakes during winter and stored in insulated icehouses (see *Figure 1*).

Ice Harvesting

Icehouses along northern wharves were a major industry. Endless chains (the forerunner of the transmission belt assem-

bly line) transported ice between icehouse, schooner and wagon. Tools and equipment long since out of use, such as horse-drawn ice planes, ploughs, and cutters, breaking-off bars, ice saws, caulking bars, grapples, hoisting tongs, skids, etc., constituted a good size supporting industry. Once in the home, the ice was stored in a refrigerator or icebox not too different from present-day domestic refrigerators (see *Figure 2*). All this represented large capital investment and jobs. Vested interests in those industries strongly influenced the resistance bulwarks Gorrie encountered once he had perfected his ice-making machine and sought to market it.

But shipping schedules in those days were unreliable. Storms around Cape Hatteras and the Florida coast accounted for many shipwrecks. Further shipping delays were incurred by fierce competition between Northern and Southern businessmen who fought over bank credits and prices of delivered ice. The retail price of Boston lake ice—when available—at the Gulf ports from Apalachicola to Brownsville before the Civil War was 10 cents a pound—expensive indeed. Dr. Gorrie determined to find a better way. What better way than to make it? So, armed with his knowledge of the laws of thermodynamics and his understanding of the transformation of energy, he set about to develop his rational cold-air refrigerating system to provide cold for his fever patients.

The Cold Air Machine

Writing in the Apalachicola *Commercial Advertiser* in 1844 under the *nom de plume* “Jenner,” Gorrie proposed that “the houses of warm countries be built with equal regard to insulation, and a like labor and expense be incurred in moderating the temperature and lessening the moisture of the internal atmosphere,” to reduce the threat of malaria. He theorized that elevated temperature and high humidity “prevents a large portion of the human family from sharing the natural advantages

they possess” and “causes mental and physical deterioration to the native inhabitants.”

In another article titled “On Prevention of Malarial Disease” (June 1, 1844) he wrote: “The proposed engine for ventilation, and cooling air in tropical climates by mechanical power is simple in its construction, requires but a small expense of power, admits of being complete in its operation, and its parts if well made are not liable to be injured by wear. It consists essentially of



From the front page of Gorrie's Patent.

Excerpt from Patent No. 8080, dated May 6, 1851

What I do claim as my invention, and desire to secure by Letters Patent is—

1. The employment of a liquid uncongealable at the low temperature at which it is required to keep the engine to receive the heat of the water to be congealed and give out to the expanding air.
2. The employment of an engine for the purpose of rendering the expansion of the condensed air gradual, in order to obtain its full refrigeratory effects, and at the same time render available the mechanical force with which it tends to dilate, to aid in working in the condensing-pump irrespective of the manner in which the several parts are made, arranged, and operated.
3. Supplying the water gradually and slowly to the freezing-vessels and congealing it by abstracting the heat from its under surface substantially as herein set forth.
4. The process of cooling or freezing liquids by compressing air into a reservoir, abstracting the heat evolved in the compression by means of a jet of water, allowing the compressed air to expand in an engine surrounded by a cistern of an unfreezable liquid, which is continually injected into the engine and returned to the cistern, and which serves as a medium to absorb the heat from the liquid to be cooled or frozen and give it out to the expanding air.

John Gorrie

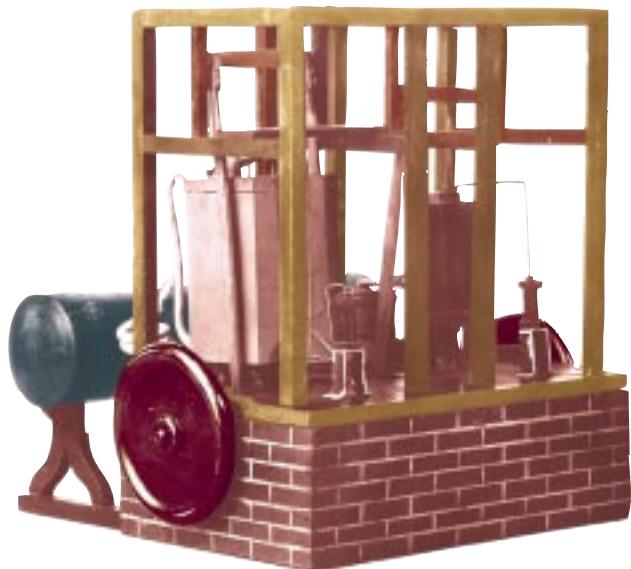


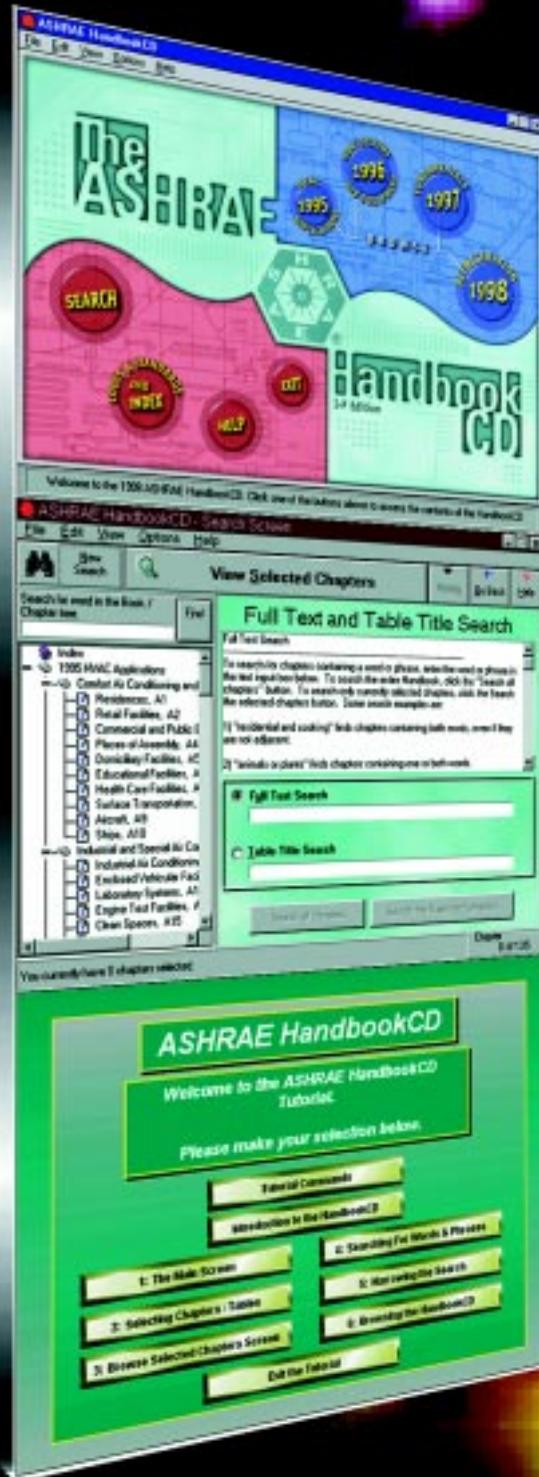
Figure 3: A model of Gorrie's ice machine from the John Gorrie Museum in Apalachicola, Fla.

ASHRAE'S HANDBOOKCD GIVES YOU EVERYTHING YOU NEED FOR EASY HVAC&R SOLUTIONS!

FAST

PORTABLE

RELIABLE



Just point and click your way to the answers you need. Using the HandbookCD is that easy!

Browse through all four Inch-Pound ASHRAE Handbooks!

- 1995 HVAC Applications
- 1996 HVAC Systems and Equipment
- 1997 Fundamentals
- 1998 Refrigeration

You choose the search method, ASHRAE delivers the answers!

Type any word, phrase or combination of selections to search:

- All 185 chapters in all four volumes at once
- Only the titles of tables

The search produces a list of all chapters containing your search phrase with the option to search all of the chapters listed or just the ones you select.

Order on-line! www.ashrae.org
Code: 81998 \$496.00 (Member: \$159.00)

Runs on Microsoft® Windows only. A minimum of 8 MB of RAM (16 Recommended) and 10 MB of available disk space required.

ASHRAE...Meeting your HVAC&R needs through Innovative CD and Online Solutions.

To order contact: ASHRAE Customer Service/
1791 Tullie Circle NE/Atlanta, GA 30329
Phone: 1-800-527-4723 (US and Canada) or
(404) 636-8400 (Worldwide) Fax: (404) 321-5478

E-mail: orders@ashrae.org www.ashrae.org

two double-acting force pumps—one for condensing, and the other for rarifying air—and an air magazine or receptacle for condensed air. It may be placed in any part of a house or ship....”

The doctor went on to describe the function of his compressed air refrigerating system and correctly predicted a future when “fruits, vegetables, and meats would be preserved in transit and thereby enjoyed by all.”

About three years were required to perfect a working model. Gorrie traveled to Cincinnati in 1848 where the Cincinnati Iron Works constructed two small model ice machines. Once constructed and tested, six months were spent disassembling the large working model in Cincinnati, shipping it down the Ohio and Mississippi rivers to New Orleans, and reassembling it.¹⁰ More than once the scientist complained about “defects of mechanical contrivance and unskilled workmanship.” No two thermometers (made for him in New Orleans) could give him reliable readings.¹¹

The Patent

Gorrie petitioned for his patent (No. 8080) in 1848, but Northern newspapers aligned with the ice trade ridiculed his person and attacked his ideas so vehemently that all backers shied away from him. He never received a penny for his marvelous invention. But this new machine provided both ice and air cooling for history’s first air-conditioned hospital ward. His process was the predecessor of the compressed-air ice-making machine used almost universally aboard ship in the early twentieth century. Just as the Wright brothers created a machine that changed the land-bound transportation systems of all before them, so John Gorrie’s achievement was a machine that changed humankind’s ability to change the environment. The importance of the centuries-old practice of ice harvesting in the preservation of food is beautifully expressed in the ancient Chinese poem, “Shih Ching” from *The Book of Odes*, circa 1100 BC.

*In the days of the second month
We cut out the ice with great blows
singing d’iong-d’iong-d’dion.
In the days of the third month
We cart the blocks to the ice houses*



Figure 4: 1913 Statue of John Gorrie by C. Adrian Pillars in the Statuary Hall, Capitol Building, Washington.

*to store ...
In the days of the fourth month
We go as the sun rises
to offer a sacrifice of lamb and
onions.**

In the tiny Dr. John Gorrie State Museum on Sixth Street, off Florida State Road 65 and US 98 in Apalachicola, some original documents as well as a model of the first mechanical refrigeration machine may be viewed (see *Figure 3*). Another model is in the Smithsonian Institute. The records are on file in the U.S. Patent Office under the Serial No. 8080 (see sidebar for an illustration and excerpt from Gorrie’s patent.)

Father of Air Conditioning?

In 1972, Raymond B. Becker of Gainesville, Fla., published his book *Gorrie, M.D., Father of Air Condition-*

ing and Mechanical Refrigeration. Twenty years earlier, Margaret Ingels, one of the first women graduate engineers in the U.S., had published her book, *Willis Haviland Carrier, Father of Air Conditioning*. Both authors, it appears, took “poetic license,” to use an imprecise phrase.

Without question, Willis Carrier (1876–1950) was one of the great men in the history of air conditioning, but he was born 28 years after John Gorrie wrote in the *Apalachicola Commercial Advertiser*: “If air were highly compressed, it would heat up by the energy of compression. If this compressed air were run through metal pipes cooled with water, and if this air cooled to the water temperature was expanded down to atmospheric pressure again, very low temperature could be obtained, even low enough to freeze water in pans in a refrigerator box.

“There are advantages to be derived from generation of cool air within any building and this is equally applicable to ships as well. It might enable the hardy mariner to better serve mankind, he who contributes so much to our wealth and pleasure by transporting for us from shore to shore, the rich production of the tropics—as animals when divested of life, and fruits which may be preserved entirely with all of their juices in a low temperature (atmosphere). This principle of producing and maintaining cold might be made instrumental in preserving organic matter for an indefinite time and thus becoming an accessory to the extension of commerce.”

In 1851, Gorrie received confirmation of patent No. 8080 for the “first machine ever to be used for mechanical refrigeration and air conditioning.”

But even before Margaret Ingels named Willis Carrier the “Father,” George D. Howe declared that, “Dr. Gorrie’s claim to fame does not rest on his production of ice by mechanical means. However, his machine was commercially practicable and his process of refrigeration underlies the entire fabric of the great cold storage industry of today.”¹²

In the most recent article on the subject, “John Gorrie, Pioneer of Cooling and Ice Making,” Bernard Nagengast, past chair of the American Society of Heating,

Refrigerating and Air-Conditioning Engineers, Inc. Historical Committee, concludes: "It would be a fabrication to claim that Gorrie is the father or the inventor of mechanical ice making or refrigeration. On the other hand, a claim can be made that Gorrie is the father of air conditioning. This claim can be made based on the fact that he was probably the first to propose, scientifically discuss, construct and operate a refrigeration machine for comfort cooling. However, it would not be proper to title him as 'the inventor of air conditioning.' No one person can make that claim. The development came through the contributions (some great and some small) of many individuals over time, building on the success of others."¹³

John Gorrie is the linchpin in the development of air conditioning. Leonardo Da Vinci built a water-driven fan to ventilate the boudoir of his patron's wife circa 1500; Dr. William Cullen invented a machine to freeze water in 1775; Jacob Perkins patented an ice-producing machine in 1834; and many others contributed to the development of what is presently "air conditioning." But it was Dr. Gorrie in the 1840s who was the first to design and build a refrigeration machine for comfort cooling.

Unrecognized Genius

At the cusp of the century, George Whiteside, who owned the first ice plant in Apalachicola, persuaded the Southern Ice Exchange to erect a monument to the man he considered the inventor of the ice machine. It was dedicated April 30, 1900, 45 years after Gorrie's unfortunate early death. The monument stands in one of Apalachicola's city squares, a tardy testament to the world's first iceman.

Late into the Civil War, Congress established the National Statuary Hall in the House of Representatives and authorized each one of the States in the Union to dedicate a statue of its most esteemed citizen, a person "illustrious for his historic renown or distinguished service" so that visitors to the Capitol could see the most revered person of each State. After Appomattox, after the Reconstruction, after the bitterness had waned and the Union began to heal, the Southern States, one by one, placed a replica of their most eminent citizen on display in the Hall. Florida bestowed this most singular honor on John Gorrie, its greatest scientist and beloved doctor. His statue—sculpted by C. Adrian Pillars in 1913, 58 years after Gorrie's death—was first unveiled in 1914 (see *Figure 4*).

Although the lack of money defeated him, Gorrie was neither motivated by profit nor dazzled by technological development. What drove him was the engine of social consciousness, the regulating idea of social responsibility. It was the search for a way to save lives that led him to his great invention. His modest statement that what he created "might better serve mankind" is as bracing as a fresh sea breeze; it reveals his true humanism.

Dr. Gorrie is unknown to most present-day Floridians. Aside from a few readers of specific history, he remains unrecognized, though his contribution is enormous. His work opened the gates to modern technology and changed forever the way America—and the world—lives and works.

It is sad to reflect that this sterling American was never able to secure financial support for the production of his machine

and died at mid-life, discouraged, financially broken and unaware that his vision of the future would someday be realized.

Notes

* "Shih Ching" is one of the six Chinese classics from antiquity. No one knows who wrote them. I wish to thank my dear friend Lee Yu-Hua for offering me this translation from the Chinese shortly before her death.

References

1. Nagengast, B. 1991. "John Gorrie, pioneer of cooling and icemaking." *ASHRAE Journal* (33)1:S60.
2. Tebeau, C. W. 1980. *A History of Florida*, 135. Coral Gables, Fla.: University of Miami Press.
3. *ibid.*, p. 16.
4. Kimball, W. 1900. *The Ice Man*. Unpublished manuscript. Florida State Library.
5. Kimball, W. 1921. "Reminiscences of Alvin Wentworth Chapman." *Journal of New York Botanical Garden* (23)1.
6. *The Journal of the American Medical Association*. 1893. (L1)20:1701.
7. Gorrie, J. 1853–1854. "An inquiry analogical and experimental into the different electrical conditions of arterial and Venus blood" *The New Orleans Medical and Surgical Journal* XI:757.
8. Gorrie, J. 1854–1855. "On the nature of malaria and the prevention of its morbid agency." *The New Orleans Medical and Surgical Journal*.
9. *Florida Sentinel*, Aug. 6, 1841.
10. Becker, R. B. *John Gorrie, MD, Father of Air Conditioning and Mechanical Refrigeration*, 120. New York: Carlton Press.
11. *ibid.*
12. *Florida History Quarterly*. 1909. (I)4. Reprinted from *Uncle Remus Magazine*, Nov. 1908.
13. Nagengast, B. See ref. 1. ■

Please circle the appropriate number on the Reader Service Card at the back of the publication.

- Extremely Helpful 450
- Helpful 451
- Somewhat Helpful 452
- Not Helpful 453