The Graphic Laboratory of Popular Science

The Story of Sugar—Its Travels

● *This is the first of two articles on the amazing chemistry of sugar and the important rôle that product has played in history and in human life.*

By GREER WILLIAMS

THE USE of sugar is commonly believed to have originated in the orient, probably India, where natives extracted it from the juice of the cane at least 2,000 years before the discovery of America. How sugar came to this continent is a story of the conquest of land and sea.

The ancient Greeks and Romans had no sugar except honey, and this was a comparatively rare delicacy. Early man satisfied his craving for sweets by eating plants containing sugar.

From the east sugar cane cultures spread westward into Persia. When the Arabs swept over that country they discovered the cane and brought it into Mesopotamia, Syria, Palestine, and Egypt. The Arabs extended its culture westward along the Mediterranean sea and by the eighth century A. D. had introduced sugar cane into Spain along with bloody scimitars.

The demand grew far beyond the ability of the Mediterranean countries to supply it, and the Venetian sea traders were quick to profit. They brought sugar, spices, and silk to Europe from the near and far east. In the fourteenth century they had a virtual monopoly on the sugar business. Sugar was still available only to the rich, either as a tidbit or a medicine, and the Venetians profiteered by keeping it so.

Europeans resented the high price of sugar, and the Portuguese decided to break the Venetian monopoly through establishment of a sea commerce of their own. While searching without success for a new route to India they spread the culture of sugar to Madeira, the Azores, Canary, and other newly discovered islands along the northwest coast of Africa. By 1472 Venice gave way to Portugal as a sea power.

Then in 1492 Queen Isabella and King Ferdinand of Spain sent Christopher Columbus in search of a western route to India. One of the islands he discovered was Haiti, to which in 1493, on his second voyage, he carried sugar cane plants.

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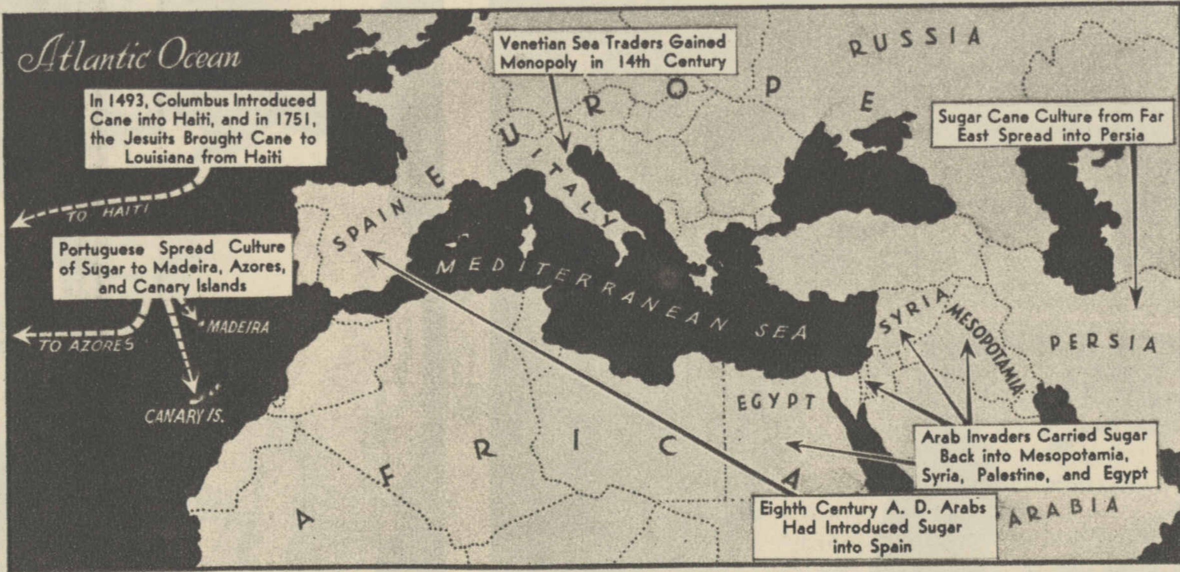
In a letter to the king and queen, Columbus, in passing, marveled "at the way a few small canes planted here have taken root." But, preoccupied with his search for gold, he was unaware of the significance of this agricultural innovation in the fertile American tropics. Others caught the idea, however, and by 1506, the year Columbus died, sugar refining was under way in Haiti, aided by the slave trade which he had introduced.

The sugar market continued to profit by slave labor for a great many years to come. When the British created sugar plantations in the Barbados in the seventeenth century the West Indies became the rival of the East Indies in supplying the European sugar market.

Sugar cane was introduced in the United States in 1751 when Jesuits brought the plant from Haiti to Louisiana. Antonio Mendly in 1792 refined the first Louisiana cane sugar, and Etienne de Bore in 1794 produced it for the first time on a commercial scale. The plantations of these two men now form a part of the city of New Orleans.

In 1747 Andreas Marggraf, working in a Berlin laboratory, discovered in a white beet the same kind of sugar found in cane. Sugar beets had been eaten for their sweetness as early as the pyramid building of Cheops. In the 1780s another German, Karl Franz Achard, developed a method of making beet sugar in commercial quantities. The British became



Map outlining the westward course of sugar through the centuries.

alarmed that their world sugar trade might be jeopardized.

Their war with Napoleon Bonaparte stimulated the development of beet sugar. When the English blockaded France the price of sugar rose to one dollar a pound. Napoleon ordered that sugar beets be made a national industry. Much was done in the establishment of the industry before the battle of Waterloo crushed the beet sugar trade and Napoleon, too.

For some years afterward beet sugar factories were unable to withstand the competition of sugar from the Indies. But protective laws and improved methods of extraction eventually put beet sugar on a paying basis in France and Germany.

James Pedder of the Beet Sugar Society of Philadelphia and Edward Church of Northampton, Mass., were the fathers of beet sugar culture in America. In the 1830s they studied European methods.

David Lee Child in 1838 established America's first beet farm and refinery in Northampton. His venture lasted only two seasons. He produced 1,300 pounds at the cost of 11 cents a pound, compared with 1 to 1½ for East Indian sugar.

The Mormons attempted to grow sugar beets and refine them in Utah in the 1850s, but were unsuccessful. The Gennett brothers, from Germany, established a factory at Chatsworth, Ill., in the 1860s, but after a few years moved their machinery on to Freeport, Ill., and then to Blackhawk, Wis. They failed commercially, however, as did fourteen beet sugar refineries between 1838 and 1879.

Then E. H. Dyer succeeded in holding his own, establishing in 1870 a refinery in Alvarado, Cal., which by 1879 was showing a profit. Eventually the government came to the rescue with a tarif on foreign sugar and by organizing beet culture research.

Stimulated by industrial progress in the refining of beet and cane sugar, which cheapened prices, the world consumption of sugar soared. In the United States, for instance, the annual per capita consumption rose from 9 to 85 pounds in the eighty years preceding the World war.

World sugar production 1913-'14 totaled 20,000,000 tons, about half cane and half beet.

As had happened time and again in history, the World war made sugar scarce and drove the price up. The American price rose from 5 or 6 cents a pound to 25 or 26 between 1914 and 1920. But sugar production in Germany and France was particularly hard hit. The world output of beet sugar was reduced by half from 1914 to 1919.

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The demand inspired the sugar islands, such as Cuba, to increase their output until during the post-war decade overproduction buried the industry in depression. The violent fluctuations of the world market have caused sugar to be called the "prince and pauper" industry, since it has made and then broken many an investor.

The United States' traditional policy has been to protect domestic beet and cane sugar producers with tarifs against foreign imports. Under the present administration, however, quotas are assigned to all areas supplying the American market. These give Hawaii, Porto Rico, the Philippine Islands, and the Virgin Islands benefits equaling those obtained by domestic producers, and permit Cuba alone to supply as much sugar as produced in the United States.

The United States consumes nearly 25 per cent of the world supply of sugar and produces about 5 per cent of it. In the 1937-'38 sugar season the world produced 36,000,000 tons of sugar—23,904,502 cane and 12,095,562 beet. Of the total 1,886,000 was American, 510,000 tons being cane sugar from Louisiana and Florida and 1,376,000 tons beet sugar from a dozen states. Colorado, California, Montana, Nebraska, Wyoming, Idaho, Michigan, and Utah are the leaders. Meanwhile United States territories—Hawaii, Porto Rico, and the Virgin Islands—produced 2,019,360 tons, all cane. Cuba, which pays a small duty, and the Philippines, whose imports remain tarif-free until the country becomes independent, produced 3,360,000 and 1,103,200 tons respectively. Their combined total is 4,463,200, about two-thirds of which was imported by the United States.

India is the leading cane sugar producer of the world, totaling 7,355,000 tons in 1937-'38, practically all of which was consumed domestically in the form of gur, a low-grade variety. Cuba ranks second, and Java third with 1,568,000 tons.

Soviet Russia leads the world in production of beet sugar, totaling 2,800,000 tons. Germany is second with 2,330,000 and the United States third.

In addition to cane and beet sugar the United States in 1937 produced 208,825 tons of corn sugar (glucose), 516,734 tons of corn sirup, 156,900 tons of cane molasses, 101,340 tons of sugar cane sirup, 47,660 tons of sorgo sirup, 10,219 tons of maple sirup, and 499 tons of maple sugar. The department of agriculture's 1938 agricultural statistics, which provided these figures, did not include honey production, which is scattered. Texas is the principal producer of sorghum and Vermont and New York state of maple sirup. Iowa heads the corn-producing states.

The United States' total annual production of sugar and sugar products approximates 3,000,000 tons, while its consumption approaches 9,000,000. Only the Australians rank above Americans as sugar consumers. Here are some pre-war and present-day comparisons of annual sugar consumption:

Nation	Pounds per capita Pre-war	Present-day
Australia	..	129
United States	85	112
England	95	91
Sweden	..	80
France	43	49
Germany	49	48
Mexico	..	26
Japan	..	20
Italy	11	19
Russia	24	14
China	..	5

The average for the world is about 31 pounds per capita.

NEXT SUNDAY—Sugar's vital role as a food.

Log of Sea Flight

● **This is the first instalment of the Tribune aviation editor's diary of his pioneering flight in the Atlantic Clipper.**

By WAYNE THOMIS

BROADWAY to the Avenue des Champs Elysées—New York to Paris in 47½ hours. Fifteen of us did it. It wasn't a stunt. What we did will be commonplace tomorrow, for we were merely passengers aboard the Atlantic Clipper, a 42-ton four-motored flying hotel. We were officially special observers, previewing the Atlantic route, the facilities and the airplanes that Pan American Airways has opened to the general public. Our flight began at Port Washington, L. I., and included landing at Horta, Azores; Lisbon, Portugal, and Marseilles, France.

Here is the diary of our flight—Chicago time is used throughout:

June 17—Port Washington.

2:30 p. m.—We file aboard, carrying our typewriters and cameras. The stewards—Joseph Raviol and René Mezenen—meet us at the door. They say: "Spread out through the rear compartments. You cannot enter the bow compartment. It is just for the takeoff. To balance the plane."

2:34—The mooring lines have been released. We are off for Europe. The Clipper sits deep in the water with her heavy load. Aboard are thirty persons—twelve crew and eighteen newspaper men and women and Pan American Airways representatives. Also we have 3,480 gallons of fuel in the wing and sponson tanks. It weighs 20,880 pounds alone, almost as much as the airplanes used on domestic air lines. Our motors tick over slowly as we slide away from the dock and head down Manhasset bay toward the open channel of Long Island sound. Around us are motor cruisers and sailboats, and Capt. Wallace D. Culbertson maneuvers us slowly through them.

2:55—We are in the air with a jerk after a run of 42 seconds. I understood why the takeoff was so abrupt when, almost immediately after we left the water, we flashed over a twin-masted sailing yacht. Hours later I mentioned the takeoff to the skipper, and he growled: "Yeah, I had to pull her off the water. There was a whole fleet of yachts in our path. They don't know enough to get out of our way, and there's no chance to keep the channel clear. They have as much right on the sound as we do."

3 p. m.—We're still skimming along 100 feet above the water. Our nose is high in the air in a near stall and our speed is slow. The motors are howling. These big boats, taking off with full load, fly in what seems almost a stall.

3:40 p. m.—There has just been another adjustment of the engines. We're at 8,000 feet, having climbed at an average of 200 feet a minute for forty minutes. We'll stay at this altitude all the way to Horta, 2,397 miles away on a great circle course, unless a change in flight plan becomes necessary. The Clipper's nose still is high in the air because the plane is carrying such a heavy load. As the load is lightened—the motors burn 1,200 pounds of gasoline an hour during the early part of the flight—the crew will trim the plane to a level flight position.

3:50—I'm sitting in cabin No. 3—third back from the bow compartment—picking away at my typewriter. We're settling down now, having explored the passenger deck from the stem—where there are 1,200 pounds of radio transmitters and receivers for broadcasts that are scheduled for later—to the stern, where the so-called bridal suite is situated. The bridal suite is a private compartment for two, with dressing table, berths, and other appointments of a Pullman compartment.

The second deck or flight deck contains the pilots' cockpit, the navigator's and radio operators' stations, the flight engineer's post, and the skipper's desk.

4:30—My first dispatch has been filed with the plane's radio operators. The plane's operators can handle only a few hundred words an hour, because they are busy for forty minutes out of each sixty in sending and receiving weather reports, position reports, and taking bearings on ships or shore stations.

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Our cruising height is above the general cloud level, and the surface of the sea has been hidden most of the time.

6 p. m.—Skipper Culbertson descended from the bridge to chat with his passengers. He ordered the women to dress for dinner, telling them that they are the first women to fly the Atlantic and therefore must set the pace for others who follow. He promised to allow them to dine at his table if they obeyed.

7:30 p. m.—Dinner. White damask, china dishes, crystal glasses, and a special sort of light-weight silverware. The stewards move deftly from table to table serving a five-course dinner. Olives and celery, consommé, sirloin of beef, rissole potato and new peas, French pastry, demi-tasse and mints. Captain Culbertson shares a table with three of the women, who are dazzling in white, gold, and blue gowns. Steward Raviol comes around pouring champagne—Pommery and Geno—just as the sun touches the horizon.

8:30—It's been dark for thirty-five minutes. We've run beneath a high cloud layer, so that there are clouds below us, hiding the sea, and clouds above. The navigator doesn't like it. He's unable to get any star sights to aid the radio in navigating the ship. He dropped into a seat to explain: "The first couple of hours out from Port Washington we took bearings on commercial broadcast stations WEEI at Boston, WEAF at Bellmore, L. I., and at WPG, Atlantic City, N. J. We used the southeast leg of the Boston radio range station (a Civil Aeronautics authority station, chiefly for domestic land plane use) to give us a ground speed check."

Capt. William A. Winston, first officer on the flight, strolls by. The captain is a veteran of the Pacific and South American divisions and is to become the skipper of the new Dixie Clipper, latest of the Boeing boats, on his next trans-Atlantic trip.

Inside the Clipper there is no indication of speed—hardly any of motion. Occasionally there is a smooth and gentle roll—much like that of a boat in a long, easy swell. Outside stars are hidden, and to me—looking out the window—it seems as though we are standing still in a vast and pitch-black window.

10 p. m.—The navigator has just taken sights on Jupiter, caught through a hole in the upper layer of clouds, that now is breaking up.

The two groups of broadcasting experts—an announcer and an engineer from each of two systems—are hard at work. The crew, the stewards, and most of the correspondents have been called to microphones to talk to New York from the ship. Several of us still are writing and the rest are turning in to berths that have been made up since the trip began.

11:12—The last hour has passed swiftly in chatting with Captain Culbertson—most of us are calling him "Cubby," his name with every one ashore. The crew, however, following sea formality, speak of him as "captain" to his face and "the skipper" when he is not present.

NEXT SUNDAY—The Beacon in Midocean.

The Atlantic Clipper hops over a private surface boat on its takeoff for its first flight to Europe with passengers. (Tribune photo.)

Mostly About Dogs

By BOB BECKER

Setter Long an Ally of Hunters

A Great Dane that has won many show honors both in Europe and America. The dog's name is Ch. Tiger Hexengold of Brae Tarn, and he's owned by F. W. Evanger of Wheeling, Ill.

THE FIRST person who systematically trained setters for field work is supposed to have been Dudley Duke of Northumberland, England, in the year 1335. This note is from Youatt's famous old book on dogs (published in 1857), and it gives us a pretty good idea of how long the beautiful, gentle English setter has been used as an ally and companion of sportsmen in the field. Popular as a show dog because of its handsome coat, style, and all-around beauty, the setter also is a great favorite of the sportsman. Because it makes an excellent companion dog, many are kept as pets in the home, too.

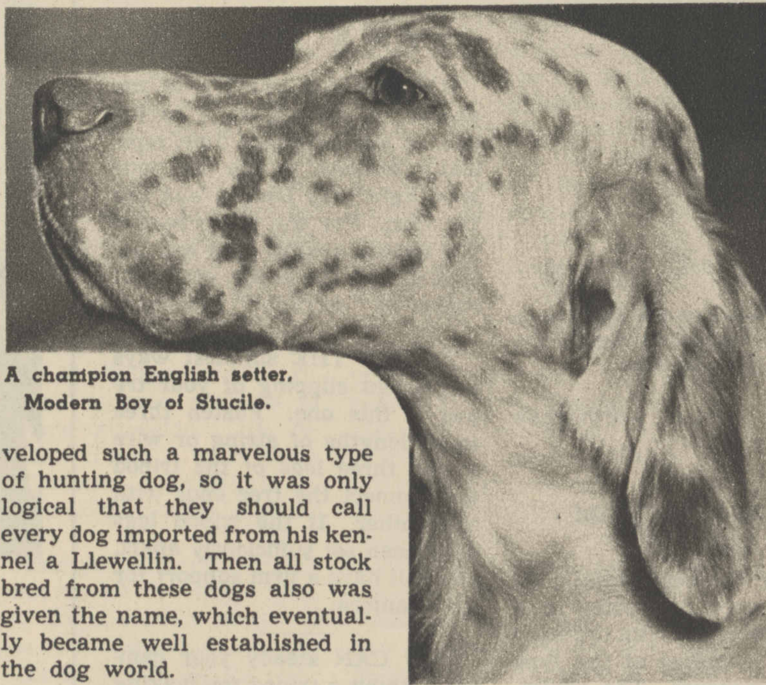
There isn't much doubt that our modern setter had its origin in the older spaniels. The spaniels from which the setter was developed probably came from Spain. The early dog fanciers wanted a "setting dog" of pretty good size. So by experimenting with several breeds, including the land spaniels, they finally developed the first setters. The most interesting document that we have seen on the early training of the setter or "sitting spaniel" for hunting purposes is one that Youatt prints in his book. It tells how a yeoman of England bound himself "fully and effectually to teach a spanile named Quand to sitt partridges, pheasants, and other game as well and exactly as the best sitting dogges usually set the same."

The yeoman asked the huge sum of 10 shillings for his work, which would be approximately $2.50 today.

Although this training contract is dated 1685 and is the first of its kind that we ever have seen, there is every reason to believe that the first "setting spaniel" or setter was trained at least several hundred years before 1685.

Laverack and Llewellin are two names that mean much in the history of the setter. Edward Laverack bred some marvelous specimens of English setters in the early part of the nineteenth century. (Two of these came to America in 1874.) Many dog fanciers still are puzzled about the name Llewellin. They believe that a Llewellin is an entirely different breed as compared to the English setter. Actually it's a blood line of English setters. R. L. Purcell Llewellin purchased two of Mr. Laverack's best setters at the time that the Laverack strain was the talk of the dog world. The dogs that Mr. Llewellin purchased were crossed with some entirely new blood which was obtained in northern England. The result of these crosses was very successful. The dogs that Mr. Llewellin produced had the qualities that made them outstanding in the field, and they swept everything before them, particularly in field trials. The reputation of these setters bred in Llewellin's kennels soon spread to America and many of them were purchased by sportsmen for field work.

American sportsmen naturally admired this man who had developed such a marvelous type of hunting dog, so it was only logical that they should call every dog imported from his kennel a Llewellin. Then all stock bred from these dogs also was given the name, which eventually became well established in the dog world.



A champion English setter, Modern Boy of Stucile.

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