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Dr. Campbell's "Malaria-Eradicating, Guano-Producing Bat Roosts"

One doctor's vision to control malaria led to a novel idea□

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One doctor's vision to control malaria led to a novel idea□

by Mari Murphy

At the turn of the century, Dr. Charles A. Campbell, a physician and former city bacteriologist in San Antonio, Texas, began the first experiments with attracting bats to artificial roosts. Although he had the highest regard for bats, the motive behind his experiments was not that he thought bats needed homes. The real reason was to find a way to control a disease that caused millions of deaths throughout the world each year: malaria. In his native Texas, mosquitoes and disease rendered countless acres of fertile land uninhabitable, and Campbell, who treated victims of malaria, knew the suffering it caused.

In the beginning Campbell thought the answer was simple: recruit great numbers of bats who, he believed, were the natural predators of mosquitoes. "Can bats like bees be colonized and made to multiply where we want them?" he wondered. "This would be no feat at all!...Don't they just live in any old ramshackle building? They would be only too glad to have a little home such as we provide for our song birds..." Campbell theorized. But after years of unsuccessful experimentation with boxes of assorted sizes and shapes, he learned that bats did not choose any "old ramshackle" roost at random.

Undaunted, his solution was to build a bigger bat house. With a personal investment of \$500.00, Campbell built the first Malaria-Eradicating, Guano-Producing Bat Roost in 1907 at the U.S. Experimental Farm near San Antonio. He called the 30 foot tall tower "my monument." Inside, a series of inclined shelves had been carefully crafted for the bats to roost upon, and 20 yards of guano saturated cheesecloth were festooned on the inside walls for their further comfort. The hopper, from which he intended to collect their droppings, was seeded with about 100 pounds of fresh guano. And to further attract visitors, he provided a meal: "three perfectly good hams with a nice slice cut out of each, exhibiting their splendid quality for the delection of the intended guests."

The bats, however, apparently didn't think much of the accommodations and never stayed at Campbell's "Hotel de Bat." In the spring of 1910, he invested more of his savings into improvements that he hoped would at last attract bats, but there were still no takers. In desperation, he captured around 500 bats from another location and imprisoned them within the tower, hoping that their squeaking would attract passers-by. That, too, failed. After six years, Campbell's "monument" was home only to hundreds of English sparrows. It was dismantled for scrap lumber and sold for \$45.00.

Dr. Campbell was so dejected after failing to attract bats after years of effort that he suspended his medical practice and left his family to spend time alone in the mountains of West Texas, pondering what had gone wrong. He spent months studying caves both uninhabited and inhabited by bats, concluding that the location of the tower was only one of its flaws. Bats, he noted after further study, seemed to prefer roosts near water. By the

time he returned to San Antonio, Campbell felt he had discovered enough of the likes and dislikes of bats to build a bat roost that he was confident would attract visitors.

He chose Mitchell's Lake, 10 miles south of San Antonio, as the site for his new improved bat roost. "No swamp in the low lands could be worse," Campbell later wrote. All of the city's sewage flowed into the lake and seepage ponds created perfect mosquito breeding conditions. It was a place where travelers were "compelled to whip up their teams to escape the onslaughts of mosquitoes." The tenant farmers who occupied the land surrounding the lake lived with such conditions from spring through fall. Mosquitoes bred in such numbers that at times the farmers were driven from their fields, leaving crops to ruin. Their livestock suffered as well; cows were emaciated and produced little milk, and chickens had pale combs and laid no eggs. Hardly a family escaped malarial infection, and two to four deaths occurred each year. In the spring of 1911, the year Campbell's new bat tower was built, he examined 87 adults and children living around the lake. Seventy-eight had malaria.

Campbell did not visit his newest bat tower for several months, having faith that this time he would succeed in attracting bats who would in turn end the suffering he saw among the tenant farmers of Mitchell's Lake. On the Fourth of July, while others were celebrating the nation's birthday, Campbell watched his bat tower all afternoon. At 7:20 in the evening, he saw what he had long awaited; the column of emerging bats took a full five minutes to leave. The performance was repeated the following evening.

Intent on filling his new bat tower with an armada of malaria-eradicating bats, Campbell turned his attention to a hunting lodge about 500 yards away. Bats took possession of the lodge during the summer when duck season was off and hunters didn't use it. Although previous experiments had failed to induce bats to leave their roosts permanently and take up residence in his first bat tower, Campbell was ready to try something else. He hypothesized that since bats located their food through a highly developed sense of hearing, certain types of sounds might prove disagreeable enough to cause them to move and not return. Noting that bats frequented churches and belfries with no apparent aversion to organs or bells, he further surmised that brass band music might provide the right measure of disagreeableness to sensitive bat ears. Since the home he had provided "in which all the conveniences any little bat heart could possibly desire" was only a few hundred yards away, he felt confident that the evicted bats would gratefully move in. With the help of an enthusiastic friend, Campbell began auditioning hundreds of records, settling on one they were certain would do the job.

Beginning at four in the morning, the bats of the hunting lodge were serenaded with the "Cascade of Roses" waltz as played by the Mexico City Police Band. Cornets, clarinets, piccolos, trombones, drums and cymbals created a cacophony of sound that greeted the bats on their 5:00 a.m. return. Campbell reported that the astonished bats circled the building again and again before giving up and disappearing into the dawn. The concert was resumed the next morning, but the bats, likely knowing what was good for them, never put in an appearance. Campbell repeated the musical production number at a nearby abandoned ranch house occupied by bats. This time he drove the bats out with "the first fortissimo" an hour and a half before their usual emergence time.

The following evening he waited for the bats to leave his bat tower. The emergence that had only taken five minutes a month before now lasted for nearly two hours. The bats never returned to either of the two houses, and Campbell was convinced he had succeeded in concentrating his disease-battling bat forces.

Over the next two years, Campbell visited the Mitchell Lake bat roost occasionally, noting that the bats returned each year and that the population was steadily growing. Word of his great experiment spread, and in 1913 an inquiry from Italy came addressed to "Bat Experiment Station, Texas, near the Mexican frontier." That same year, nearly one million cases of malaria were reported in the American South when the Public Health Service, a newly formed U.S. government agency, inaugurated its first controlled experiment to prevent the disease in the United States. Using the Ross techniques, malaria was eradicated in communities in South Carolina and Mississippi. Ronald Ross, the British surgeon who identified the *Anopheles* mosquito as the carrier of malaria, developed the classic methods of mosquito control—soil drainage, oiling stagnant ponds, screening buildings, regular use of mosquito nets over beds, and the isolation of infected patients.

Campbell, meanwhile, was having success with less costly methods. In 1914, four years after the Mitchell's Lake roost was built, duck hunters told Campbell that they could now remain in their blinds until after dark because there were so many less mosquitoes. That summer Campbell began collecting testimonials from the tenant farmers around Mitchell's Lake. They all reported much the same thing: they could now irrigate their fields at night without hordes of mosquitoes attacking them, their work animals were healthy, and there had been no sickness in their families. Campbell didn't find a single case of malaria where four years before 89% of those tested had the disease.

During that same year, the Bexar County Medical Society endorsed Campbell's work, and on June 8, 1914 the City Council of San Antonio passed an ordinance making it unlawful for anyone to kill a bat within the city limits, levying fines from \$5 to \$200 for each bat killed. Soon after, they appropriated \$3,000 of City funds to build another bat tower, the first Municipal Bat Roost in San Antonio or anywhere else. Not to be outdone, the Texas State Board of Health also endorsed Campbell's work and passed their recommendations on to the State Legislature to make it a misdemeanor to kill bats within the entire state. The Governor signed it into law on March 10, 1917.

The original Mitchell's Lake bat tower gained such fame that Campbell opened the area to the public, providing seats and picnic benches for people to watch the evening emergence in comfort. Several more towers were built around San Antonio, and eventually a total of 16 were erected from Texas to Italy, the last one in 1929. The guano harvest from the Mitchell's Lake roost in 1921 was 4,558 pounds, two tons of dry, ready-to-use bat guano with almost double the nitrogen content than cave guano, an amount repeated year after year. At its peak, Campbell estimated that the Mitchell's Lake roost contained over a quarter of a million bats.

In 1919 Charles Campbell was nominated for a Nobel Prize for his work. Local physicians and health officials proclaimed the results of his bat roosts. Dr. E.H. Elmendorff, Assistant County Physician in San Antonio stated "...when the municipal bat roost was built...I felt confident that [it] would do for that locality what the bat roost did at Mitchell's Lake; and in this I was not the least mistaken, as malaria has been wiped out from among the permanent residents in that section of the city, and the only agency that prevents the transients from transmitting the disease to the permanent residents is the municipal bat roost, with its large colony of bats..."

Campbell watched the malaria situation at Mitchell's Lake for six years, visiting every several months. He asserted that malaria had been eradicated there "solely by the cultivation of that transcendent little creature, the bat." Campbell maintained that conditions for mosquito breeding remained the same—all that changed was the addition of

the bat tower. He detailed his claims in the 1925 book *Bats, Mosquitoes and Dollars*.

Charles Campbell died in 1931 after some 30 years of observing bats. As late as 1948 his last heir, Mrs. Milton Campbell, received \$500 a year from the annual guano crop of the Mitchell's Lake bat roost. She hoped that after her death the state would preserve the tower that still attracted hundreds of naturalists and bat enthusiasts a year, but it no longer stands. In the mid-1950's, rabies hysteria gripped Texas and bats were taken off the State's protected species list. The end of the bat roost that had once gained the admiration of the world passed without much notice.

Campbell boasted that his bat towers would stand for a century, but today there are only three left, two on private property in Texas and one on Sugarloaf Key in Florida that was never successful in attracting bats. Over the years the others fell to vandalism, age, and urban renewal. Campbell never advocated that bats be used as the sole method of controlling malaria; he merely argued that bats could do the job with less expense and human effort and, in the end, a community would be rewarded with some of nature's best fertilizer for their gardens. What more could you ask?

Mari Murphy is Editor of BATS.

Note: Disappearance of malaria from the San Antonio area during the time of Dr. Campbell's work is well documented, though the extent to which his famous bat roosts could be credited was not scientifically studied and is therefore open to question. The only Campbell bat roost remaining in the San Antonio area still shelters Cave myotis and Mexican free-tailed bats (see "A Campbell Bat Tower Restoration Project in Texas"). The success of Dr. Campbell's experiments can no longer be tested, since most of his bat roosts and the original mosquito breeding conditions are now gone.



(portrait of Dr. Campbell)



Circa 1916 □ Dr. Charles Campbell, the first bat house designer, proudly poses on the cross bars of the San Antonio Municipal Bat Roost. Signs on the roost describe its purpose along with a copy of the local ordinance protecting bats. PHOTO BY THE SAN ANTONIO EXPRESS-NEWS



The 1918 bat guano crop from the Mitchell's Lake "Malaria-Eradicating, Guano-Producing Bat Roost" was 4,012 pounds. Once the bat colony was established, the roost averaged two tons a year. PHOTO BY THE SAN ANTONIO EXPRESS-NEWS

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