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Burning Questions Solved

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In 1864, a Confederate terrorist cell quietly infiltrated 19 hotels in and around New York's busiest streets and planted 12 dozen incendiary devices. The bottles contained "Greek Fire," a Civil War concoction named after a weapon invented by the Byzantines that allegedly burned on water. The Confederate incarnation was primed to ignite when exposed to air.

Luckily for unsuspecting Manhattanites, the agents carrying out the bomb plot were completely ignorant about the science of fire. They opened the bottles and left them burning inside locked bedrooms and cupboards—thereby depriving the flames of oxygen. Most of the fires died out of their own accord.

The wonders of fire fascinated and baffled our 19th-century forebears. The Victorians were particularly excited by "spontaneous combustion." Could a man really self-ignite? Charles Dickens believed so. In "Bleak House," he turned the aptly named Mr. Krook into a pile of ashes on the floor: a "smouldering, suffocating vapor in the room, and a dark, greasy coating on the walls and ceiling."

Forced to defend himself against charges of sensationalism, Dickens pointed to several well-known cases, including that of Countess Cornelia Di Bandi of Cesena, Italy. The Countess had gone to bed on the night of April 4, 1731, a healthy 62-year-old woman. In the morning all that remained of her was a circle of ashes, three fingers and her legs from the knees down.

Dickens defied his critics to come up with a scientific explanation that could account for such mysterious deaths. His challenge remained unanswered for the next 160 years. In fact, the latest recorded case of spontaneous human combustion (SHC) happened in February this year, when authorities in Oklahoma discovered the charred corpse of Danny Vanzandt inside his otherwise pristine house.

But scientists have not been idle. Now, finally, it appears that the secret behind SHC has been unlocked. Last year, Brian J. Ford, a research biologist and author based at Cambridge University, set up a series of experiments using belly pork soaked in highly flammable acetone. The purpose was to mimic a dangerous condition called ketosis, when the liver produces toxic levels of ketones, which contain acetone.

According to Prof. Ford, the tiniest spark was sufficient: The pork mannequins burned to ash within half an hour. "The remains—a pile of smoking cinders with protruding limbs—were exactly like the photographs of human victims."

The chemistry behind spontaneous fire has solved one other Victorian mystery: the tragedy of the Mary Celeste. In 1872, the ship Dei Gratia was halfway between the Azores and the Portuguese coast when it came upon the Mary Celeste floating aimlessly on the water. The crew and passengers were missing, yet nothing had been disturbed. Clothing, valuables, enough food and water to last six months, and even the ship's cargo of 1,701 barrels of industrial alcohol were still on board. Thanks to a short

story by Arthur Conan Doyle, the Mary Celeste became the stuff of legend.

The mystery endured until 2006, when Andrea Sella, a professor at University College London, noticed that nine of the 1,701 barrels had been found empty. Theorizing that the alcohol had leaked into the air, he simulated a controlled explosion using butane gas and cubes of paper. "There was a spectacular wave of flame," Dr. Sella reported. "But behind it…no burning or scorching." Having blue flames suddenly shoot out of every hatch would have been enough to terrify the occupants of the Mary Celeste into fleeing for their lives.

Ironically, the ship survived, but they did not.

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