

Rutgers forensic scientist shares zombie survival guide

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Kimberlee Sue Moran recalls that she was living in London in 2002 when she and her friend went to see the new zombie flick, *28 Days Later*. The film turned everything that she thought about zombies on its head, depicting the animated corpses as fast and aggressive, rather than slow, plodding figures. "My friend and I clung to each other the whole way home," recalls the Rutgers–Camden forensic scientist.

While admitting that she still has a "slightly irrational fear of zombies,"

Moran knows full well that there is nothing really to be afraid of. "It all comes down to the science behind it," says Moran, who serves as an instructor for the Department of Sociology, Anthropology and Criminal Justice.

Just in time for Halloween, the Winslow resident shares her zombie survival guide, peeling back the skin on the science of dying, along with the cultural and religious traditions surrounding [death](#). "Between rigor mortis – the body going completely rigid – and putrefaction – the body liquefying – any 'true' zombie, unlike the 28 Days Later variety, would be either too stiff or too sloshy to come after you!" declares Moran. While apparitions of all forms – from wicked witches to friendly ghosts – have captivated people's imaginations, she says that humans' primitive fears and fascination with death can be boiled down to two simple reasons: it is a phenomenon that we don't understand and one we can't control.

Moran explains that, due to modern medicine, there are actually two types of death – somatic death and [cellular death](#). Somatic death, she explains, means that a human is basically brain dead. "There are no more electrical pulses in the brain; you are no longer a unit of society," says Moran, who recently earned "Scientist of the Year" from the Philadelphia Geek Awards.

Cellular death means true death followed by decay, which occurs in two stages: autolysis and putrefaction. The [human body](#) is designed to self-destruct, due to the structure and various processes of cells that mirror those occurring on a larger scale in the human body. For instance, the nucleus functions like the brain of the cell, running the cell's main operation. Another organelle, lysosomes, works like the cell's stomach, breaking down food to use for energy and other purposes. When a human dies, the cells are programmed to actually start digesting the cells themselves. "You literally start to eat yourself," she says. "You self-

destruct, as the cells rupture and all of the goo comes out. This is the first stage of human decomposition, happening immediately after death."

In putrefaction, she explains, the "friendly" bacteria living in the digestive tract become responsible for decomposition. "They are friendly, but they get hungry," she says. "So when you die and aren't taking in any food to feed the bacteria in your gut, they get a little upset and basically begin to break down their host." Eventually bacteria spread throughout the entire body, she adds, noting that the greenish tinge of a corpse is due to the bacteria traveling through all of the veins and capillaries.

While the order and various stages in which a body breaks down are known, the rate of decomposition is not constant, explains Moran. There are too many contributing factors, such as temperature, pH factor, bioactivity, moisture, and age and health of a corpse, to determine how long it will take in any given situation. "On CSI, they can say, 'This body has been dead for 3.2 hours,' but we can't do that in real life," she says.

Moran notes that there are countless rituals and practices from various cultures and time periods to illustrate how people have dealt with the uncertainty and fear of death. For instance, ancient Egyptians believed that death was a spiritual journey, requiring them to mummify the bodies and equip the tombs with a variety of artifacts for a full and exciting afterlife. In some Native American cultures, death was just as another part of life, while in others, it petrified its members. For instance, according to Apache lore, when someone died, they not only destroyed the body, but the person's house and all of their belongings, fearing that their ghost would return to follow the living.

"These cultural and religious practices are all meant to calm our fears and give us a sense of control," says Moran. "Performing these rituals makes us think that we know something about death, therefore we can

cope with it. It is more for the living than it is for the dead."

She adds that, in the same respect, Halloween customs began as a way to deal with the uncertainty and fear of spirits thought to roam freely each year on "All Hallows Eve." Children thus donned costumes to ward off or blend in with these spirits, explains Moran. "It was essentially a coping mechanism; it gave us a sense of control," she says. "There are all of these spirits out there, so I am going to embrace it, rather than be afraid."

While she understands the reality of death like few others do, Moran is quick to note that she finds the process to be "very comforting," explaining that it is simply the way that nature recycles itself. "It is how we reintroduce ourselves back into the nutrient system," she says. "The space that we inhabit while we are alive can actually give back to nature, and those nutrients can now produce a tree or a flower. In some ways, it is a legacy to decompose."

She adds that, while forensic scientists treat death as a scientific phenomenon, it is always important to remember the humanity of death. "In order to be the most effective investigator, you need to be mindful of how a [body](#) should be treated, and sensitive to the wishes and needs of the family during what is a very emotional time," she says.

As a forensic archaeologist, Moran has worked on a number of cases in a range of capacities, including as provider of forensic services to legal professionals in the United Kingdom. She is an active member of the Society for American Archaeology, the U.K. Fingerprint Society, the Association for Women in Forensic Science, and Forensic Archaeology Recovery. She earned a bachelor's degree in classical and Near Eastern archaeology from Bryn Mawr College in 2000, and a master's degree in forensic archaeological science from the Institute of Archaeology at University College London in 2001. Her research is in the field of

ancient fingerprints.

Provided by Rutgers University

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