Building Frankenstein: A Physiology Game

Kneeling in front of a formed pile of wet sand high on the beach, the young girl holds up two sticks into the sky, pauses, and brings them down hard into the sides of her creation. "I give you liiiiiiiife!" she shrills into the empty, drying face below her. Its ice plant hair trembles, but its lifeless kelp gas bladder eyes show her no sign of intelligence.

Frankenstein is borne within many creative minds, even before they are introduced to Mary Shelley's story, or see images of a cobbled-together green monster on Halloween. Understanding, creating, or controlling the mystery of life is the dream of some children and adults alike—which is why it is the perfect subject for an educational game.

I propose to create an online game (working title: *Building Frankenstein*) that enables users to mesh together parts of distantly related animals (including humans and Frankenstein-esque parts) to try to form their own Frankenstein creatures, as they explore the intricacies of human and comparative anatomy and physiology. By matching compatible and incompatible parts, with information pop-ups to guide them in their creations, users will learn basic comparative physiology such as differences in heart structure and circulatory systems, eye development and use, bone structure and strength, brain function and abilities, and breathing anatomy. They can then explore the reasons why different physiologies may not match up. Users will learn that the eyes of some cave creatures don't enable accurate vision and that frog lungs wouldn't enable enough oxygen exchange to fuel flight. They will also learn more about our own physiology, for example, a giant earthworm body with added human legs wouldn't be able to pump blood fast enough for the human limbs to survive or work properly, due to the open vs. closed circulatory systems of these animals. By exploring our differences and similarities to animals, they will learn about what it means to be human.

The game will be paired with a companion story. It will lead readers through an introduction to Mary Shelley's Frankenstein and review the current science of reanimation and regeneration. They will follow stories of frog bodies freezing solid through winter, then thawing out and resuming life in spring; they will learn how humans are trying to use cryopreservation to enable suspended animation; how other animals dehydrate almost completely and are by all definitions lifeless until rain comes and returns their function; and how some animals can regrow limbs that are removed. Our gamers and readers will investigate this thin edge between death and life, will creatively explore anatomy and physiology, and will also learn how, historically, science fiction stories often lead the direction of research and development in many of the sciences.

The game and companion story are the two deliverables from the project, and they will be housed on Ask A Biologist (askabiologist.asu.edu; AAB), an online educational program started in 1997. AAB provides free access to educational games, stories, interviews, experiments, activities, and more, and provides a direct link between site visitors and volunteer biologists ready to answer biology questions. In 2016, the site had over 11.2 million visits from 195 different countries; the number of visitors grows every year, due in part to our constantly expanding content. AAB games are particularly useful to engage students in learning. The top game housed on the site was visited over 247,000 times last year, with many other games falling in the range of 30,000 to 80,000 visits per year; thus, we expect the impact of this game to be very large. The game will be advertised on social media by AAB's Dr. Biology accounts, which amount to a few thousand followers. We will also likely get the School of Life Sciences to promote the game through the SOLS magazine, as well as through social media.

I will be the writer and the director of game creation (devoting my time at no cost), but funds are needed for game development and for illustration creation. I will contract out game design to the

trusted coders and game developers that I have worked with closely on previous games for AAB. The Waggle Dance (askabiologist.asu.edu/bee-dance-game) is the most recent example of a game on AAB for which I directed and wrote game text; it was released earlier this year. My experience writing and editing for AAB is extensive, as I have been working either as a volunteer or an employee for the site since 2010, when I wrote my first piece for the site, A Monster Story (askabiologist.asu.edu/monster-story), which is an educational resource on DNA that is written in a children's book style that links to Monster Maker (askabiologist.asu.edu/monster-manual), another successful game on Ask A Biologist. I would begin development of *Building Frankenstein* and related content in October of 2017, with a goal of a finished game and all finished educational resources being made available online by the end of June 2018. The Frankenstein Bicentennial Small Grants Program would fund the entire project; I do not have matching funds and this would not be used as seed money toward a larger project or grant application.

As far as I know, there is no existing Frankenstein-based game that teaches players about human and comparative physiology, and I know *Building Frankenstein* would successfully use the intrigue and excitement of the Frankenstein story to capture the imagination and interest of thousands of children, students, and lifelong learners across the globe. In addition to teaching visitors about life, human physiology, and the current state of science in this realm of Frankenstein reanimation, this set of educational resources will also sit firmly at the creative edge between science and art. AAB emphasizes the art of storytelling and relies on artistic representations (mainly illustrations) to improve student understanding and engagement. *Building Frankenstein* will be an excellent outlet for this SciArt fusion. I believe this would be a great tribute to Mary Shelley's Frankenstein, and I thank you for considering my proposal.