

ALIEN AUTOPSY: FAKE BODIES, REAL SCIENCE. Dave Dooling¹, ¹New Mexico Museum of Space History (P.O. Box 5430, Alamogordo, NM 88311. Dave.dooling@state.nm.us).

Introduction: Learn basic astrobiology as you dissect *Tortilla volante* and *Oceanus ericius*, denizens of the deep from Europa, aboard space station *Antaeus*.

Alien Autopsy is a role-playing activity inspired by NASA's Orbiting Quarantine Facility (OQF) study [1], *The Andromeda Strain* [2], and the notorious 1995 fake documentary [3]. It addresses the issues of water and bacteria as key components in understanding life [4]. The 2017 movie, *Life* [5], will increase interest in the field.

Alien Autopsy was developed at the New Mexico Museum of Space History in summer 2013 and has been improved over the past three years. Students act as scientists aboard the *Antaeus* OQF where they examine *T. volante* (flying tortilla; grades 4–8) or *O. ericius* (oceanic porcupine; grades K–3), creatures collected from the sub-ice ocean of Europa. It can be presented as a one-hour standalone activity, or the capstone of a weeklong summer camp. It supports several aspects of Next Generation Science Standards.

Specimens: Bodies are made from non-meat products to avoid ethical and cultural objections to using killed specimens, to eliminate meat-related sanitary issues, and to let us tailor the design to the putative environment rather than present something out of a supply catalog (like the mythical jackalope, we stitch together features from different animals). *T. volante* is made of tortilla back and belly skins filled with pasta, toothpicks, clay, candy, and other materials to present a realistic anatomy. If time allows, students also take basic chemical readings with pH, ketone, glucose, and other diagnostic strips. The simpler *O. ericius* is made from a pickle with rigatoni pasta forming the alimentary tract and toothpicks for spines.

Procedure: *Alien Autopsy* proceeds in three main parts, Introduction, Dissection, and Analysis. A survey is given at the beginning and repeated at the end to gauge changes in perception. We use a 5E Learning Cycle that shifts from student- to teacher-led because of time constraints:

Introduction: We cover misconceptions that life has been found elsewhere, that life must have sunlight, and that only large, complex life counts. We introduce unusual life forms on Earth, then set the stage for the *Antaeus* laboratory. We cover the definition of life, extraterrestrial life, habitability, and exploration of Earth and the solar system. This includes drilling through ice (Antarctic and Europa) to reach new biomes, and employing telerobotic and virtual

reality (ultimately giving operators the feel of being hands-on with the specimen).

Dissection: Students work in teams as they dissect bodies and record discoveries. To enhance role-playing, students in grades 4+ work in plastic gloveboxes (Fig. 1) inspired by biohazard cabinets and the *Antaeus* study, and use disposable gloves, picnic knives, and plastic forceps. Safety glasses are added if gloveboxes are not used. They take turns as lead investigator, recorder, and dissection technicians. Students in K-3 work in pairs without specific roles. During dissection we kibitz to prompt responses and ensure teamwork.



Figure 1: Girl Scouts working in a plastic glovebox dissect *Tortilla volante*, the “flying tortilla” of Europa.

Analysis: Students present what they think they found and justify their conclusions to their peers. We explain what we had in mind when we designed the body and how structures indicate function and environment.

References:

- [1] DeVincenzi, Donald L. and Bagby, John R., eds. (1981). *Orbiting Quarantine Facility: The Antaeus Report*. (NASA SP-454).
- [2] Crichton, Michael (1969). *The Andromeda Strain* (Knopf), and the 1971 movie.
- [3] *Alien Autopsy* (1995). Fox TV.
- [4] Slater, Timothy F. 2014. Astrobiology Education and Public Outreach. In *Astrobiology: An Evolutionary Approach*. Kolb, Vera M., ed. CRC Press, 2015.
- [5] *Life* (2017). Trailer on line at lifemovie.com.