

SAMPLINGS

For this issue, we asked Stewardship Science Graduate Fellows what drew them to science and to stewardship science in particular. Here are two answers.



Aware of Our Surroundings

BY JOSH RENNER

Third-year fellow

Physics includes things we can see and things we can't. The mountains, lakes, and forests we see are made up of well-known particles: protons, neutrons and electrons. In large numbers these particles construct our familiar world, but individually they are minuscule and can move about, invisible to the eye. They are joined by other less familiar particles, too short-lived or elusive to appear in our daily observations but still surrounding us, some passing right through us.

There's often a tendency to ignore things we can't see, but it's important to stop and think about what's really going on around us.

My research involves improving ways to detect and study particles in forms that are infrequently encountered but are important to technological advances and to understanding physics. I develop technology to search for a nuclear reaction, yet to be observed, called neutrinoless double-beta decay. In short, I work on particle detectors.

Particles invisible to the eye can be detected in other ways because they have energy. Just as a stone thrown into a pond creates a splash, a particle deposits a small pocket of energy when it interacts with a particle detector. Atoms in the detector material receive this energy. Small energy exchanges may simply bump an atom like colliding billiard balls, but larger amounts of energy may knock electrons out of an atom. These electrons are one component of the energy splash that can be measured to confirm a particle's presence.

Highly energetic, fast-moving particles are classified as radiation. Radiation can originate from radioactive matter on Earth or from high-energy particles that are expelled from the sun and other entities in space. We have learned to redirect energy from radiation sources on Earth into nuclear power and have used radiation to develop cancer treatments. Our manipulation of nuclear material also has generated nuclear waste – radioactive material that must be kept isolated until it is no longer dangerous. Without proper attention, these materials could present a hazard or fall into hands that seek to transform them into threatening weapons. We must ensure we can efficiently identify nuclear materials, monitor them carefully and make educated decisions about their use.

Stewardship science aims to understand radiation and know its whereabouts. Greater knowledge ensures more responsible development and use of nuclear materials, and future security for our planet. We must remain diligent or radioactive materials could slip by unnoticed. I study stewardship science because I'd like to know what is going on around me, whether I can see it or not.



A Science Nerd Spreads the Word

BY STEPHANIE LYONS

Second-year fellow

I've always been a science nerd. When my second grade teacher asked, "And what do you want to be when you grow up?" I answered, "I want to be an entomologist!" Not knowing what an entomologist was, she replied, "Oh. Umm, well, that's nice." As my fear of spiders and other creepy-crawlies grew, my interest in being an entomologist waned and my aspirations shifted toward forensic expert, geneticist and finally to physicist.

A turning point came in my senior year of high school, when I reluctantly took an introductory physics course. As the semester began, I noticed correlations between it and my calculus class. Simple equations that could model a baseball's flight through the air or a particle's motion in a cyclotron fascinated me. In college I started a double major in physics and biology, then dropped biology. After working in the University of Notre Dame's nuclear structure lab one summer, I was hooked.

During my first year of graduate studies, I saw that family members and nontechnical friends held misconceptions about what scientists do and what science can provide. Without science, many wonderful devices and technologies – from cell phones and transportation to life-saving medical equipment – would be impossible. Yet when it comes to energy resources, public fears hinder technology's advancement.

Being able to communicate possible advances and breakthroughs is what drew me to stewardship science, and I have since become active in science outreach events at and around Notre Dame. People must better understand scientific advances to make informed decisions in their day-to-day lives. In this sense, all science can be steered toward stewardship. To lead the way, scientists should give back to the community through communication and outreach.