HE might be examining molecules, but Dr. James Anderson is moving mountains.

The role of ribonucleic acid in protein synthesis is vital to all living things, and while scientists have studied RNA for more than a century, they are still unraveling clues to the mysterious building blocks of life.

Anderson, associate professor of biological sciences, recently discovered a particularly important clue: an RNA process that is essential for cell survival. In what has been lauded as a “landmark discovery” by colleagues around the globe, Anderson’s development laid the groundwork for what is sure to be a cascade of follow-up projects by others in his field. It’s a critical first step that could lead to breakthroughs in the treatment and prevention of disease.

Anderson has always been passionate about basic science, and he loves when his research becomes the pebble that produces a ripple effect. “There will certainly be applications to medicine and disease. We just don’t know what they are yet,” he points out. “What’s exciting to me is how that will unfold.”

During normal synthesis, a certain protein group modifies the RNA molecule by adding to it a carbon-hydrogen compound known as a “methyl group.” The addition of this methyl group allows RNA to function properly during synthesis; without it, the RNA is defective.

“Genetics revealed that a defective tRNA molecule is recognized by a completely different protein group,” Anderson says. “We discovered that a particular protein group adds a ‘tail’ of nucleotides to the tRNA. It is that tail that signals to the cell that the tRNA is faulty.”

Anderson notes that HIV — the virus that causes AIDS — utilizes RNA to capitalize on cells’ own components and compromise the body’s immune system. While his discovery in yeast may not provide direct answers for curing this deadly disease in humans, understanding how cells deal with faulty RNA molecules during protein synthesis could ultimately reveal how the virus turns the human body against itself.

Just as RNA and other genetic materials are the foundation for all living things, basic science like Anderson’s work is the cornerstone of practical research and developments in medicine, genetics and other applied sciences.

No one, including Anderson, knows how his research will be ultimately applied. And that’s OK with him.

Says Anderson, “I want my research to provide opportunities and resources for other scientists.”