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Physics 101: Observing Physical Creation

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Physics 101: Observing Physical Creation

Abstract

"Physics is fundamentally about repeatedly observing the Creation, building models that describe our observations, and then making predictions about what we will observe in the future."

Posting about the study of physics from *In All Things* - an online hub committed to the claim that the life, death, and resurrection of Jesus Christ has implications for the entire world.

<http://inallthings.org/physics-101-observing-physical-creation/>

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Comments

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Physics 101: Observing Physical Creation

 [all in allthings.org/physics-101-observing-physical-creation/](http://allthings.org/physics-101-observing-physical-creation/)

September 20, 2016

Kayt Frisch

When I tell a new acquaintance that I am a physics professor, they frequently respond with some variation on “I was really bad at physics” or “I didn’t really like or understand physics.” They make these comments almost apologetically, as if they are afraid of hurting my feelings. The truth is that I’ve been there; I’ve failed at least one physics test in my life, but despite this set-back, somewhere along the way I was captured by a vision of a new way to look at the Creation. Hearing people tell me that their first association with physics is “I was bad at that” fills me with sadness, because physics can be so much more.

So, what is physics? Physics is humankind’s attempt to understand how physical aspects of the Creation work. Many an introductory physics student gets hung up on plugging numbers into equations and believes that that is all there is to physics. It’s true that equations (perhaps more accurately named mathematical models) are part of the nuts and bolts of the discipline (and truth be told, it is next to impossible to do physics without at least some math!), but physics is fundamentally about repeatedly observing the Creation, building models that describe our observations, and then making predictions about what we will observe in the future.

One example of this cycle is the ongoing search for “dark matter.” In the 1900s, physicists (and their close cousins, astronomers) observed that the light from all the stars that we can see from earth is red-shifted, which means that all the stars in the observable universe are moving away from us.¹ The mathematical models these scientists constructed predicted that this movement should be occurring at a certain rate, however further observations lead to the discovery that this model was not sufficient – in fact the rate is increasing over time, which meant a revised model was needed. The current model (based on observation) explains these observations with “dark” matter and energy. This is physics on the scale of the universe. This is the wonder and glory of God’s Creation, seen through the methodical study of the physical universe.

In 1916 Albert Einstein published his theory of general relativity, which turned our understanding of interactions within the Creation upside down. He postulated that space and time form a physical entity, not unlike a four-dimensional fabric (three dimensions for space and a fourth for time). This fabric could be stretched and contracted, not unlike the surface of a trampoline, and could sustain ripples, like you observe when you drop a rock into a still pond. He called these ripples gravitational waves.² Almost 100 years later, LIGO used two laser interferometers, located a continent apart to directly observed the waves that Einstein’s model predicts. This is physics on the scale of galaxies. This is the wonder and glory of God’s Creation, seen through the methodical study of the physical universe.

At the end of the 19th century, a physicist named Wilhelm Roentgen was playing with a new piece of technology called a Crooke’s Tube. He spent several weeks questioning his sanity after he noticed that even though there was no light visible in the room, unexposed photographic negatives acted as if they had been struck by light. Roentgen had discovered of X-rays, which eventually contributed to a new model for light, and soon X-rays were being used to help surgeons see inside the body without first cutting it open (the first known medical use of an X-ray was to remove the point of a needle that had broken off inside the hand of a factory worker). In the years since his discovery, physics has developed more techniques to see inside the body: ultrasound (making pictures with sound echoes), MRI (using magnetic fields to image the hydrogen atoms in the body), CT (X-rays again!), and PET (using radioactive decay of atomic nuclei to see function inside the body). This is physics on the scale of the human body.³ This is the wonder and glory of God’s creation, seen through the methodical study of the physical universe.

175 meters under the ground at the CERN facility Switzerland is a tube that is 17km in circumference.⁴ This is the

Large Hadron Collider, or the LHC. The purpose of this giant circular tube is to accelerate atoms to nearly the speed of light and then smash them together. The extremely high energies of these collisions means that connections which are extremely stable in every-day circumstances (like the connections between the quarks, which make up the more familiar protons and neutrons are broken, and in the tiny fractions of a second following the collision, physicists can see traces of what they call “elementary particles.” The Higgs Boson, the particle that we think gives all objects mass, was discovered a few years ago at the LHC. The Higgs Boson and the other elementary particles comprise “the Standard Model,” which is our current best model for the fundamental building blocks of matter (though string theory is on a quest to find an even smaller, more fundamental unit). This is physics on the smallest known scale in the universe. This is the wonder and glory of God’s Creation, seen through the methodical study of the physical universe.

These examples are a small sample across the breadth and depth of the physical Creation, seeing the work of our Creator through the methodical study of the physical universe that we call physics. So what is physics? Certainly “equations” are part of the story, but at its heart, physics is about observing the Created Universe and saying “I wonder how...?”. Physics gives us an additional set of eyes so that we can be filled with a new and deeper sense of awe at God’s physical Creation, and with the psalmist we can say: O Lord, our Lord, how majestic is your name in all the earth.