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Opening Remarks for Introductory Physics Courses

Welcome! My name is Dr. Jordan Hanson, and I am your instructor for introductory physics. I'd like to take the opportunity to welcome the freshmen who are new to our community. At Whittier College, we strive to create an environment that helps people of all walks of life to succeed. I have been a physicist for 15 years, and I know that this material may appear intimidating or challenging to you. When people ask me about my profession, and I tell them I'm a physics professor, most react with a shudder. This is likely because they had a rough experience with a physics or mathematics course in high school or college.

Our highest goal for this course is for you to learn. We are not here to create learning spaces that are overly competitive or intense, but rather a space in which you learn as much physics as possible during our time together. As such, during your time in the classroom with me, you will not be graded. I will present material, pose questions, and we will solve problems together. We will also perform experiments, and eventually, you will be presenting the results of a science project you create with your lab group.

I want you to learn to become comfortable with being wrong. I am a professional scientist who conducts experimental research and publishes it in journals read by scientists all over the world. Trust me, I am wrong all the time. I am wrong, and that is fine. When we pose a hypothesis, build an experiment, perform that experiment, compare our data to the hypothesis, and draw a conclusion, *we are never actually wrong.* Our hypothesis may succeed with reasonable accuracy and precision, or be top inaccurate to be deemed correct. At no point are *we* the ones who are *wrong.* What matters is the theory that generated the hypothesis. Say to yourself today: "I do not know everything, therefore I am wrong about some things, and that is fine."

Being comfortable with being wrong is liberating. Finding a hypothesis to be false when compared to data can be as useful as one that is right. Other times, the data and hypothesis can match, but the theory is still wrong. In the early days of American astronomy, leading scientists had evidence that the Milky Way was the only galaxy. The data matched their expectation, which was actually false. Their contemporary European astronomers, such as Sir William and Caroline Herschel collected evidence of the existence of other galaxies. A debate erupted, and many believed themselves to be "right" and others "wrong." Finally, the American Edwin Hubble confirmed galaxies outside ours. In such debates, it is important to remember that hypotheses are often flying about, and their truth is not firm. What is firmly under our control is *our choice to believe them*. We are not required to believe anything in science, and that liberates us from the fray.

The liberation that arises from our comfort with being wrong is empowering. If we are unafraid of our hypotheses failing, we are inclined to try different hypotheses and conduct experiments. We grow comfortable with the scientific process. With practice, the scientific process ultimately leads us towards being right. And when we become accustomed to finding the right solutions, and forming better hypotheses, we build confidence as critical and analytical thinkers. Lastly, we are liberated enough to feel creative, to *create new science.* And at every step, we find joy and excitement in that moment when we must compare our prediction to the answer. Let's be wrong together.