# Undergraduate Teaching Philosophy of Gary Prézeau

I believe that learning is a lifelong process where curiosity, critical thinking and basic knowledge about the world are crucial to a fulfilling professional life. As a physicist, I believe I have key skills for fostering these qualities in students since science and technology was furthered by curious, critical thinkers who had a basic understanding of the physical laws of nature. Physicists typically have very strong problem-solving and mathematical skills. My objective as a professor is to assist students in the development of these talents as I convey to them the nuts and bolts of physics. I would add the larger goal of fueling in them a robust spirit of inquiry that will provide them with the necessary momentum to thrive in todays information economy.

To achieve these objectives, I will use a spiral approach to teaching. During the term, the lecturer using this technique revisits the same concepts again and again at an increasing level of complexity. The advantage of this technique lies in the familiarity the student acquires with the basic principle explored—thereby increasing the likelihood of retention—and the observation that a relatively simple principle can explain a wide range of apparently unrelated phenomena.

This is a technique I used when I lectured at the University of Malawi, Chancellor College in Zomba. Malawi is a developing country in East-Central Africa where the quality-level of the various educational facilities is not geographically uniform. As a result, students from the Northern third of the country (populated mainly by Tumbukas) were generally better prepared than the rest of the students and are more likely to be admitted into the national university system. The historical origin of this discrepancy can be traced to the fact that missionaries were most active there, following Livingstone who spent years in the North. Although the students take national exams to be admitted into the University of Malawi, there exists an affirmative action program that guarantees a diverse student body at the University (Malawi has three main ethnic groups: the Chewas, the Tumbukas and the Yaos). Thus, I lectured to a broad range of students from different ethnic backgrounds with widely different abilities. The spiral approach was particularly well suited for this situation because it allowed me to go over difficult concepts repeatedly (both mathematical and physical as I had to devote a number of lectures to mathematics to fill gaps in the students training) which benefited the students with weaker backgrounds while providing depth to the students with broader backgrounds. The classes I thought were both introductory and advanced:

- **First Year Laboratory.** For this 1st year course, I rewrote the lab manual and included a detailed section on error analysis.
- **Computational Physics.** I created this introductory course and taught them the basics—from the components that make up computers and how they work, to simple programs. I also wrote a manual for this course.
- **Electromagnetism.** At the beginning of this class, I tested the students to see what they knew. From the results of this preliminary test, I realized that I would have to

spend a considerable amount of time going over vector analysis and calculus. Although I relied on the Marion/Heald book *Classical Electromagnetic Radiation*, I spent a lot of time creating my own notes for the students.

- **Modern Physics.** For this class, I used the ever reliable Eisberg and Resnick, *Quantum Physics Of Atoms, Molecules, Solids, Nuclei, and Particles.* This was quite a successful class because the students were particularly interested in quantum physics and did not have to learn the mathematical apparatus of quantum mechanics. Other than the Schrdinger equation which required a basic understanding of differential equations (and that I introduced only at the end), most of the problems for this course could be solved with relatively simple mathematics.

- **Quantum Mechanics.** This course was more difficult to teach. I used Cohen-Tannoudji *Quantum Mechanics* for this class because it is filled with so many physical examples of quantum mechanical problems. This class required an introduction to Linear Algebra. Thus, although the students struggled with linear algebra, I found a similar but simpler problem (usually discussed in Eisberg and Resnick) to ground them in the physics of the problem they were trying to solve.

- **Classical Mechanics.** I taught this class using the Berkeley physics course and included at the end a discussion of Einsteins theory of special relativity. Although the students struggled somewhat with some of the mathematics, they also had a better sense of the physics thanks to their laboratory classes.

For all these classes, I had to provide detailed notes as the student stipends did not cover the purchase of books. I made these notes available to the students by photocopying them and putting them on reserve at the library. Also, I found that the students responded very well to the basic respect I naturally showed them. Something as simple as my habit of putting on a tie for all my lectures, to my visible dedication in assisting their learning went a long way in keeping them motivated.

In the United States, I was also a teaching assistant in astronomy for one year. Although, I have not yet had the privilege of being a professor at a North American university, I do feel that much of the experience I acquired in Africa is transferable, including teaching to an ethnically diverse class room with substantial variation in talent and training. Furthermore, my dedication to my craft would remain as intense.