



Curious people

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Professor Bill Ward

Curious biochemist, Rütger's University, New Jersey, USA

Age: 75

Professor WW Ward has recently retired from Rütger's University, New Jersey, USA (http://dbm.rutgers.edu/pages/William_Ward.html). He has studied bioluminescence for over 40 years, and was a pioneer in purifying and characterizing the green fluorescent protein from the bioluminescent jellyfish *Aequorea*, and the sea pansy *Renilla*. He began this work with Howard Seliger at

the John's Hopkins University, Baltimore, Maryland, characterizing the Ca^{2+} -activated photoproteins from two ctenophores, *Mnemiopsis* and *Beroë*. He then moved to Milton Cormier's lab at the Department of Biochemistry, University of Georgia, Athens, Georgia, USA, where he made an extensive study of GFP, without which the Nobel Prize for Chemistry in 2008 to Shimomura, Tsien and Chalfie could not have been awarded. Bill then moved to Rütger's, where he uniquely developed GFP as an educational tool. He is a member of the Editorial and Advisory Board of The Young Darwinian. Here is his take on curiosity during his early days, and later in life.

I am a bit "CURIOUS" about what to write — what sorts of ideas, in general. Since this curiosity story is directed at young people, I think I would like to talk about my early life — pre-teen and teenage experiences, and beyond. There was plenty of curiosity in my early life. In this essay, I would like to make things

highly personal. I hope this is appropriate. Much of my early curiosity was not scientific, but it WAS very creative. I had more hobbies than anyone I knew, most of the hobbies very unusual, very creative, and very time consuming. These early 'intellectual' explorations were in the areas of arts, crafts, and, then, many years later, music. Especially instrumental in my entry into the world of experimental science was my early experience with design (of crafts in particular). I will give you a couple of examples.

While, as a high school freshman, I did very well in Latin I. But, over the summer months I forgot everything I had learned. So, right away, as a sophomore, I had trouble with Latin II. Rather than fight this, I came up with two creative ideas.

First, our Latin teacher gave the students credit for translating, orally, lines from the book. I came up with a clever way to appear that I really knew

Latin. So, every night I would identify the most difficult passage — the harder the better. I wanted to be the only student to volunteer to translate that sentence. So, I studied that translation and no other one. As I was the only person to volunteer for that sentence, I stood out as the best student in the class. Everyone else chose an easier sentence, or did not bother to study at all. Clearly, I was always the best prepared., and I was always prepared to translate the hardest sentence. There was NO competition. Nobody raised a hand to translate this sentence. For the whole year, nobody caught on, including our teacher. I always appeared to be the best student, and again, I got an A. I never thought this was cheating. I just thought it was clever.

Secondly, since I had developed a lot of skills in artistic, creative design —from a very early age — I came up with an extraordinary extra credit project that nobody else in the school would (or could) do—also in Latin class. I built tiny working models (about 3 to 6 inches in size) of nearly every weapon pictured in the Latin book — cross bows, catapults, chariots, etc. It took weeks and weeks to build 15 or 20 models. I even used a tiny strip of leather cut from my father's old wallet as the driving force (spring) of the catapult. I much preferred this construction project to studying and memorizing Latin. All I needed for inspiration was to see the illustrations of these weapons in the Latin book. I used no other resources, except stuff I found around the house.

In 4th grade, a kid came into school with a relief map created with a flour and salt kind of mortar or plaster. His was a very poorly executed project. Immediately, I knew that I could do a much better job. So, at home, I experimented with the composition of the material, until I had that part perfected. Then I learned how to make rivers, lakes, mountains, and valleys, and how to use food colouring to delineate individual states in the US. I even learned how to make my own tracing paper, by ironing Crisco-covered paper. This is similar to how early colonists made semi-transparent window 'glass'. Later, I expanded the project to parts of the rest of the world. I must have made 30 such maps over the years. It took weeks to make the maps, but it gave me immense pleasure to be doing something that I know nobody else could (or would) do.

In humanities, in college, our professor was teaching us about ancient Greece. She wanted us to identify, in a quiz, the features of the Acropolis, pictured in the textbook. But, in those days, there was no such thing as a Xerox machine. Making multiple copies of a picture from

a textbook meant drawing the picture first, and then running off multiple copies of the drawing with a stencil machine or mimeograph machine. Somebody in class needed to draw the picture. The teacher admitted that she could not draw, so she asked the class if there was anybody who could draw this picture. Nobody volunteered. After a minute or two of silence, I raised my hand, meekly, to say that I liked to draw. This was not really truthful. I did not know how to draw something as complex as the Acropolis, but I knew that I was willing to try. She said, 'OK, you are it'.

Well, drawing the Acropolis was much more difficult than I thought it would be. The viewing angle in the book was mid-way through the Acropolis hill. Buildings above the plain of view appeared as trapezoids, wider at the base and narrow at the top. The opposite was true for buildings below the plain of view. I had a devil of a time with perception, and with the details of buildings and statues. Everything was so intricate. Finally, I got it done, and it was magnificent. At quiz time, she passed out the mimeographed copies for us to identify 10 marked objects in the duplicated drawing. I, of all people, got two wrong — 80%. So intent was I with the drawing that I did not memorize the structures. I got a B or a C on the quiz. I don't remember which, but it was surely not an A. On top of that humiliation, I got no credit for drawing the picture. But, I did not give a damn. I had done something creative that no other student was willing to tackle.

Now, in the field of biochemistry, my motivation is working creatively. I love to design experiments, even if the experiments, themselves, fail. I love the challenge. I really don't care that I am not a walking encyclopedia of knowledge - and by no means am I even a little book of knowledge. I just like to create excellent approaches to experiments. And I get great satisfaction from carrying out the experiments I design. Ironically, while I have done creative projects all my life, I never thought, years ago, that I was preparing myself to become a biochemist, a researcher, or a professor. I just went in the direction that gave me pleasure and a measure of self-worth.

Now, at my ripe old age, I am being drawn to the arts. With GREAT trepidation, I began singing in a little Unitarian church chorus at age 42. I had to be arm-twisted many, many times, before I consented (reluctantly). Never before had I sung in public, and I had received no lessons in music — not a minute of training. I was really nervous. But I grew to like the experience and,

slowly, I began to develop some skills. Now, aged 75, I am singing in a sophisticated classical chorus, and taking weekly voice lessons from an opera singer. I have been singing and training intensively for the past 8 years. I have to say that it is strange to see a 10-year old leave my tutor's house, as I arrive, and to see another little kid arrive after I finish my lesson. But, despite this bit of humiliation, I am really progressing. In fact, our chorus has become sufficiently skilled to be invited to sing, just this past June, the Mozart Requiem in a giant cathedral in Vienna - the thrill of a lifetime.

I hope this story is an inspiration to the kids who will be reading 'The Young Darwinian'. I really think this is the most valuable lesson I can impart. I hope you agree that it can be helpful.

Editor's note: This article emphasizes that curious people are curious about everything. What about you? Email us info@theyoungdarwinian.com

A few of Bill's key publications

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