

Interview with Dr. William (Bill) E. Conner, Professor of Biology, by Frannie Speer

FS: Tell me a little about your background. Where did you grow up?

BC: I grew up in Kewanee, Illinois, which boasts to be the hog capital of the world. I'm not so sure it is, but that's what they say. And while I was young, I worked with my father a lot; he was a general contractor, so I spent a lot of time building houses with him. I think that's prepared me somewhat to be a scientist because I liked machinery and how things work and stuff like that. I also played high school sports...I was a football player. I was a little larger then. I went to Notre Dame in South Bend, Ind. That was a popular destination for Illinois students. It was about four hours from my home. That's really where the science bug hit me. I had a really wonderful mentor there. His name was George B. Craig, Jr.

FS: Tell me a little about your family growing up. Do you have siblings? Where do they live and what do they do?

BC: I have one brother; he was four years older, unfortunately he is deceased. And I have a younger sister, she is 3 years younger. She lives with my mother in Reno, Nevada. They moved from Illinois about 20 years ago.

FS: What did you want to do when you were young?

BC: I went through a whole series of things. At one point I remember wanting to be an architect because I drew a lot for my father. I drew a lot of plan for various homes. I enjoyed that a lot. I had a really cool drawing board and did a pretty decent job. When I was looking at undergrad institutions, I thought I wanted to be a chemical engineer. I looked very strongly at Purdue, but then I figured out where chemical engineers hang out. They hang out at big industrial complexes with lots of chemicals and big vats and things. That became less attractive to me. Then I settled on biology at Notre Dame.

FS: Please tell me about the work you do now. I want to understand your job better.

BS: I have three projects. The one that is going the best right now is our bat/moth project, and it's about an ancient arms race. It's 50 million years old; that's when bats and moths started to get together. Bats use their high frequency sonar to find their food, and their food includes moths. We are interested in how moths avoid being eaten. We work on a pretty exotic group of moths called tiger moths. There are 11,000 species of them in the tropics throughout the world, so we get to travel to some pretty interesting places [to observe them]. Their claim to fame is they are brightly colored; they are the peacocks of the moth world. They answer bats. So when they hear the echo location signals of bats, they click back at them.

There are three possibilities of why they do that. One is that they are startling the bat. It's like my dropping a book and making a really large noise and you jump. The second idea is that they are warning the bat that they are distasteful. It's kind of like a bright coloration in a butterfly or a poison arrow frog...but if you are communicating with a bat you can't use colors, [so] you use sound instead. The third possibility is that they [the moths] are jamming the sonar. It's

much like warfare where we jam the radar of guided missiles so they don't hit our fighter planes. It's possible that the moths are jamming the sonar capabilities of the bats.

We have gathered evidence for all three of those [possibilities]. Our most recent discovery is that they are jamming the sonar. The way we study this is we have a bat cave in the basement of this building [Winston Hall, the Biology building at Wake Forest] where we have high speed videos of bats and moths interacting. We also have an outdoor bat facility. Right now, we work in southeastern Arizona in the summer, where we set up our high speed cameras and video the natural interactions [of] 18 species of bats and about 30 species of moths. I have a student-- Aaron Corcoran--who has developed a voice recognition software so we can video tape and record. Using the voice recognition software, we can figure out what bat species that was and what moth species that was. We don't have to touch anything. We can view the natural interaction in the field. I work with two graduate students (one post-doc) and lots of undergraduates. The undergraduates go in the field with us during the summer.

We also study speciation in tiger moths in the Galapagos Islands. Like Darwin's finches, they underwent a radiation, and we study how that happened. I also have a new project on the behavioral genetics of autism. There is a lot of interest in autism in children. There are thought to be 40 or 50 genes involved in autism. We can put those genes into *Drosophila melanogaster* flies and see how their behavior changes. So for example, we are interested in one particular mutation called DFMR1, [which is] a gene is thought to be involved with autism in humans. When we put it in flies, the flies develop some autism-like behaviors. Then we can use the flies as a drug screen. We can test various sorts of drugs to see if they can rescue normal behavior in the flies. If they do, that would be a potential drug for use in children.

FS: What are your favorite things about your job?

BS: I really, really like teaching. That is one of the reasons I am at Wake Forest. I do that every day and it is probably the best part of my day. On the research side, I like to make discoveries and learn new things. Whenever we see a moth doing something new and cool that no one has ever seen before, we get a pretty big rush out of that. The sonar jamming was a really big deal. I actually had an idea during lecturing about how to test it. That was a great day. It was a "eureka" moment. I realized we had a very easy way to figure out those three hypothesis and which was correct—the startle, the warning, or the sonar jamming. Those three questions have kept my lab going for about a decade. A series of three very gifted graduate students and a swarm of undergraduates have been working on it and we've been making progress.

FS: Do you have advice for people going into this kind of work?

BS: Find a mentor. I've had a series of mentors, and those were critical moments in my career. I can look back now and realize it, but at the time I might not have realized it. When I started doing research it was when I was a sophomore in college, and it was for a very strange reason. One of my friends--I admired him--he was a science major and he had a desk in the Bio Chemistry lab. That was a place where he could study away from the noise. I thought that was really cool because I had to study in my room [where] it was noisy, or in the library, [where] it was noisy, so I really wanted a desk. And that's a strange reason to do research, but I asked him

how to get a desk and he said he talked to a professor about doing research. So I thought that was cool and I made a list of 3 professors I would talk to. And I knocked on the first door, and the professor threw me out. I walked in and said, "I think I might want to do research in your lab" and he said, "Go away! I'm talking to my graduate students. I don't have time to talk to you." I think that was a life lesson for me. The next person happened to be a German scientist, and he did essentially the same thing; he sent me away.

So I was getting pretty discouraged and I was down to the last name on my list, and that was George B Craig, Jr. On his door it said "Vector Biology," which means mosquitoes are vectors of disease. I didn't necessarily know that at the time. I walked in and I'd like to do research. He looked at me, he was a 350 pound guy, huge, he hit his fist on the desk and said, "Wonderful, follow me." He took me to a desk and said, "This is going to be your desk. Here is a big pile of paper, read these, and we will talk about your research project." That was how I got started. I was surrounded by graduate students and post-docs, all of these people working really hard on mosquitoes and disease. There was also a promise that I would get to go to Africa with him, which was pretty neat too. I never got to go, but that was there.

That was my first mentor. You have to remember, I was still a pre-med. When I became a senior, I went into his office and said, "Dr. Craig, I think I want to be a Biologist instead of a pre-med." He went, again, "Wonderful, I was hoping you'd say that. Over Christmas break I want you to go see this guy, Tom Eisner at Cornell; this guy, Carol Williams at Harvard; and this guy Vincent Dethier at Princeton. You can go to graduate school at one of those places. He made phone calls and set up appointments for me.

So off I went with a friend of mine in his car. We went to Cornell first, and I absolutely loved it because Cornell is in Ithaca, New York. Ithaca is kind of a small, beautiful town. In Illinois I grew up in a town of about 14,000 people, so a small town is what I was looking for. I then went to Harvard. I hated it. I almost got hit by a fire truck in Cambridge. The fellow who I was supposed to interview with took me from lab to lab to lab, all basically Chemistry labs, and each professor would show me the book that he had just written. I was incredibly intimidated, and they invited me to tea at 4 o'clock. The concept of sitting down with these people at tea just didn't excite me, so I went home. I didn't go to tea. I decided to go to Cornell; I never even went to Princeton. Cornell was definitely a wonderful place for me to be.

FS: Can you tell me about the path that led you to Wake Forest and how long you have been at Wake?

BS: I've been at Wake since '88. Prior to that, I was at a university 80 miles down the road whose colors are dark blue. That was my first job as a professor. I wasn't a very good match at Duke. I really wanted to teach a lot and to do it very well. They were more interested in my research. I actually won teaching awards at Duke given by the students, and that was very gratifying to me, but I decided it was time to go somewhere else. I had given a seminar at Wake Forest while at Duke, and I really liked Wake and the students that went to my seminar. I heard a job advertisement at Wake and I applied for it. There was also another story about that. I was at a meeting in London on insect communication. (This was about the time I was thinking about moving). I ran into the chairman of the Wake Forest biology department. His name is Ron

Dimock, Jr. I recognized him from the seminar I gave at Wake. We ran into each other in a museum in London. We had a little time to chat, and I told him I was looking and he told me about the Wake Forest job and told me I should apply for it. I have been extremely grateful ever since. The match is much better here. They want you to teach, want you to teach well. If you do research, that is great too

FS: What do you think you will be doing, or where do you think you will be in ten or fifteen years?

BS: Hopefully I'll be on the beach fishing! I'm 61, so I'm starting to think about that. I don't think I'm going to retire on time, at the earliest possible age or anything like that. I want to keep doing my science as long as I am productive. But fifteen years is a long time! At that point time I will probably be fully retired. I'm looking at 70 as my target age.

FS: Do you have a family of your own?

BS: I'm married and have a cat. I don't have any children. I admire people who have children immensely. I sort of have children vicariously...I call them students.

FS: Do you have any special hobbies or interests?

BS: I suppose I don't have too many hobbies. I certainly like to grow things, so I help my wife in the garden a lot planting things. I like to go out on the ocean on fishing boats, and luckily one of my friends owns a boat. Lately, we've been going out on the boat a lot. Most of the times I work, which is one of the reasons [why] retirement is frightening. I work half-days on Saturday and half-days on Sunday. I feel pretty good about it because if I work in the morning then I feel good about resting in the afternoon. And of course the regular five days a week.

FS: Do you think about the idea of "The American Dream"? Does it have any special meanings for you?

BS: I can't imagine myself doing anything different. I am pretty happy with the career that I've had. Being a Biologist is wonderful for travelling. I haven't gotten to go every place I'd like to go. As I mentioned, we work in South America. I've been to the Galapagos Islands 8 or 10 times. Mainland Ecuador has been pretty important. We work in the cloud forest and rain forest of Ecuador. If you live long enough as a scientist you increase in stature, and then you get invited to places to talk about your research. My most recent trips were to Australia, where I went to an international Congress I gave a lecture in an auditorium about the size of our coliseum; it was big. It went pretty well. The most recent one was in France. I had never been to France, so it was great to go to Paris and spend some time [there]. As a scientist, you get to go to these cool places to talk, but you are allowed time to explore the culture. The travel has been a really nice fringe benefit of being a scientist. I want to teach at one of the overseas houses but I haven't been able to do it yet. I applied once, but apparently they didn't like my application. It is definitely on my list. I have some courses I think would be very attractive to students.

There's one thing I haven't gotten the chance to talk about, and that's the Entrepreneurship program. People wonder: Why a scientist is running the entrepreneurship program? I teach a new course that is a combination of biology and business, and students really seem to enjoy it a lot. It was the student interest that attracted me to the program.

At one point I had a young woman in my office. She was a first-year advisee, when they come in and usually talk about what courses they want to take. She came in and said that she had this dream She want[ed] to start a non-profit like one of Paul Newman's camps, where over the summer, students with untreatable diseases could come and she could help them. She wanted to start this near Chicago. I thought this was pretty amazing that a freshman could come in and tell me that when the others are asking me what Bio112 is. I said that I wasn't sure I could help her, but I had friends in the business school and I would call them. I called a fellow named Page West in the business school who teaches entrepreneurship. That was the beginning. I started meeting with groups of faculty and students who thought entrepreneurship was a good idea.

The way we look at it is [this]: what we are creating is not necessarily a business...what we are creating is value and that can be artistic value, social value, environmental value, scientific value, as well as the classical economic value. That is the basis of our program. We think that entrepreneurial thinking helps any student. It's a bit like leadership. Entrepreneurs are very good at getting things done. Students are very good at getting cool ideas. Sometimes they can't follow through on them. By taking a few entrepreneurship courses, they learn how to follow through. I've watched students do all kinds of things, different projects from straight science projects, to developing iPhone apps, to working in Africa on social entrepreneurship. The students seem to flock to it as something that they want to do. Part of the reason is that Wake Forest students are pretty darn independent. They are independent thinkers, so they want to make things happen and want to know how to make things happen. That's what the program does for them. Right now I think it's the biggest minor on campus. My first job in the program was to develop the minor.

We have recently changed the name of the office. It is now called Innovation, Creativity, and Entrepreneurship. We are thinking about growing the program bigger. We are probably under-appreciating the innovation and creativity parts. We need to pump those up a bit and keep the entrepreneurship parts about the same.