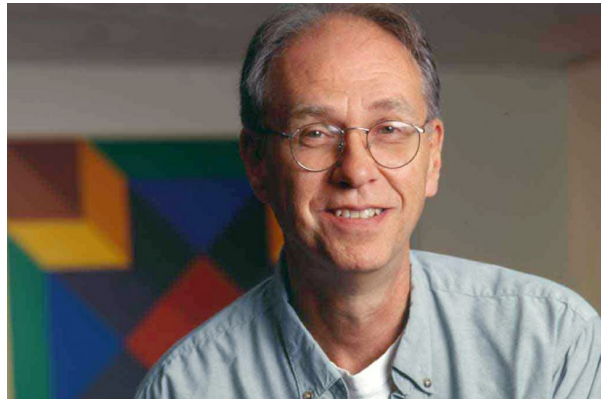


Questions I Was Asked - Xiamen, China

Michael S. Waterman

Editorial: Professor Michael S. Waterman is one of the founders and current leaders in the area of computational biology and bioinformatics. He focuses on the creation and application of mathematics, statistics and computer science techniques to molecular biology, particularly to DNA, RNA and protein sequence data. Professor Waterman is an elected member of the American Academy of Arts and Sciences (1995), the National Academy of Sciences (2001) and the National Academy of Engineering (2012). He is also an elected Foreign Member of the French Académie des Sciences (2005) and the Chinese Academy of Sciences (2013). He was awarded the 2015 Dan David Prize for his contributions to the field of bioinformatics. We would like to thank Professor Bin Yu for her great recommendation of this article and help in acquiring the permission from Professor Waterman.

This article summarizes the interesting and inspirational conversations between Professor Waterman and students from Xiamen University during his summer trip to Xiamen in 2015.



On June 19, 2015 I attended "The Conference on Bioinformatics and Intelligent Information Processing" in Xiamen China. Xiamen is a beautiful coastal city with an impressive history, although almost anywhere in China has a long and therefore to an American an impressive history. I gave the first and only non-Chinese language lecture at the conference. The conference was held in a Days Hotel that is the Chinese hotel chain affiliated with Days Inn from the USA. Whereas the USA Days Inn Motels are not luxury accommodations, this Days Hotel in Xiamen was a 4 Star establishment. It fascinates me when a company reinvents itself like this. (Pizza Hut in China is another example of this phe-

nomenon.) In the three days I stayed in the hotel, I saw no people who were not East Asians, and even on Gulang Island, a famous tourist attraction, I only saw one other non East Asian person.

Prof. Xuegong Zhang, my friend from Tsinghua University in Beijing, was an organizer of the conference. During my visits to Tsinghua, Xuegong has often set up meetings with groups of students. So he suggested to faculty at Xiamen that they take advantage of my presence for a similar event. Prof. Ying Wang from Xiamen University was the organizer. They called it a "salon" and in the evening after dinner we went to the University campus. I was told later that due to me being an English speaker, the faculty were concerned if any students would attend and if they did whether they would participate by asking questions.

The session had about 50 students; they filled the room completely. Ting Chen, my colleague from USC for many years, began the event. He spoke in Chinese and during the evening whenever needed he translated questions into English and the answers back into Chinese, although this was not required too often. (I am embarrassingly and hopelessly deficient in speaking or understanding the Chinese language.)



The students had found my USC website and harvested some photos in a folder labeled "Off-Job Photos" and had some of them cycling onto a screen. They were impressed by the outdoor photos and had one of me with cross-country skis strapped to my back and snowflakes on my down jacket and beard which they labeled "Desert Adventure." I think the main message they got just from looking my website was that I have interests and activities far outside of research and academics.

Ting spoke in Chinese at the beginning to intro-

duce me and my career, saying that after that, I'd speak for a while and then he'd open it up for questions. In fact he did not go on too long before a hand went up and a student said, "Excuse me, I have a question." And this went on non-stop for the rest of the evening. Unfortunately there is no transcript or recording so what I describe below are just the questions and answers I recall. All are approximations of course, and we all know how memory alters what actually happened. It is easy for a person in my position in such a situation to be pompous and lofty and that may even be revealed below. I try to be straight, direct and sincere, and not to pretend I know things I do not.

Question: How can you balance personal interests with study and research?

Answer: We all know people who manage this gracefully. And there is also the balance between family life and work. My own life is not a good example because I have had periods for example, where I spent all my energy on the outdoors and hiking, and other times when I spent almost every waking hour doing research and study. This is probably not a good example for your life, but it is possible to go from extreme to extreme.

Question: If one person takes everything as a task and tries very hard to do things well but without much interest, is that person suitable for research?

Answer: I cannot imagine doing successful research without a driving interest. Perhaps it would be a better idea to find a goal such as making money that is desirable, and then finding ways to achieve that. In other words find an interest (which might not be research). But I believe any topic we learn enough about is interesting in the end. Often we are not interested in something because we don't know enough about it yet.

Question: I do not recall this question precisely but it was about finding information for their research.

Answer: Students today are more expert on using Google and Baidu than I ever will be! So I should be asking you. Sorting out reliable information is an issue and in science we should find original sources and study them.

About this time the one child in the room raised her hand and said crisply, "I have a question." Actually

Joyce had two questions she had prepared and written out, and she came back later with more. The second time I told her other hands were up from people who had not asked a question and she'd have to wait. The students all said, "No, no, let her ask!" So we were all enjoying Joyce's participation.

Joyce: When did you know that you were a scientist?

Answer: Not until university. In the 7th grade at 12 years old, I found out something existed called chemistry but I could not find any good material about any scientific topic until I got to university.

Joyce: So I think you became a scientist when you were 12.

Answer: This was a very smart observation, because although I could not access any decent scientific text until I was at university, the knowledge that science was out there in the world changed my relationship with everything. "Why?," although always entirely unanswered, became a central focus in my life.





Question: *Your life has been successful but there must have been difficult times. Tell us about one of them and how you handled that.*

Answer: What a tough question! There have been many such times, and I had to think to pick something appropriate and not too embarrassing! I choose my masters thesis where my adviser gave me a something to prove that was wrong in a very uninteresting way. He was unable to suggest anything else and it was a crisis for me. Without a masters degree, my life as I saw it developing was blocked. Eventually I found by myself a problem in the same area of statistics and managed to solve it. My adviser couldn't even tell that the work was good although others did. A few years later I published the result in a very good journal. I learned from this that I needed to choose to be around people who were more capable!

As I said above the students found my website. On it are a few chapters about my New Mexico experiences with two chapters about my friend, the great mathematician Gian-Carlo Rota. In one chapter I speak of his love of fancy restaurants and good food. I remark that I thought his greatest weak-

ness regarding food was his complete dismissal of all Asian food.

Question: *What about Gian-Carlo and Chinese food?*

Answer: I could only repeat what I wrote in the chapter. Perhaps being a sophisticated Italian and European caused this - I cannot explain it. But he was wrong on this.

Question: *Gian-Carlo said to you, "You know too much." What did he mean?*

Answer: This one I can answer. Gian-Carlo once proposed that we write an article explaining biology to mathematicians. I did not have time when he proposed it but kept it in mind. Finally when I did, he made that Rota-esque remark. What he meant was that I had learned too much biology to allow me to write a paper readable and useful to those who did not know biology. It never occurred to me that anyone would find my telling of this story mysterious or obscure.

Question: *I enjoy life Xiamen so much, but I have not much interest in major learning, what should I do?*

Answer: This is a difficult question for me to answer. There are many lives to live other than those of university and research.

A student asked a question in Chinese and it took quite a while to answer. What I said in discussion was not satisfactory to him. His was a version of the God question, how to reconcile religious beliefs with science and biological theory. It was made more awkward because my friend Ting is deeply religious and also disbelieves evolution.

Answer: I take no position on the origin of the universe or even the origin of life. But I do believe evolution happens today and what we observe in the living world is the result of the evolutionary process. It is captured in Dobzansky's great quote "Nothing in biology makes sense except in the light of evolution." Men have selectively breed corn, dogs, horses etc and obviously (to me at least) we have modified biological organisms for our use. But this was all seat of the pants guesswork until Darwin told us how to view the world via the lens of natural selection. That along with knowledge of genetics and DNA sets us up for the modern understanding of the biological world. This was not convincing either to Ting or the student. When I pointed out that our supposedly uniquely human traits such as tool making are shared with other animals - not that we are not different from them - the student mentioned having a soul as a counterexample. I did not ask for a scientific definition of the soul. People will believe what they will and I am fine with that so long as I am able to do the same.

Question: *Hard work or interests, which is more important.*

Answer: Both!

Question: *How can you make enough money in the modern world?*

Answer: Money was never of great importance to me. I want enough money to be healthy and secure, and beyond that I just want an interesting life.

Question: *Are you happy now and how about your happiness compared to that of 10 years ago?*

Answer: I had to think about this one. I am happy and contented now and probably that is not much different from 10 years ago. I did not think to give one of my favorite sayings, "The secret to happiness is low expectations."

While writing this account, I recalled more than I thought I would and I got help from Ting, Ying and some students. In the question about locating information about research topics I wish I had said more. As must be clear I greatly enjoyed the spirited and interesting exchange. A Xiamen faculty member sitting in said afterwards that 10 years ago such an event would have had very little student participation. This is a positive sign for the students and for China. They are actively thinking about their future and I think they will engage it creatively. Just to be alive and actively engaged with the world is a great prize, as I tried to say, and there is no formula for a great life!



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