Interview with Dr. Catherine Fenselau by Dr. Yetrib Hathout

1. Tell us about your childhood and high school in York Nebraska

I have good memories about being a child (Catherine Lee Clarke) in York Nebraska. Going to school, I remember all the corn fields and farms around me. I also remember the kindness and the warmth of the teachers!

York Nebraska was a town of 6000 people. The county was in an intensive agricultural area. My class in high school had 73 people in it. We all knew each other, we all liked each other and we all did things together regardless how much money the family had or how much ability the student had. It was good opportunity for me to connect with all kinds of people. One interesting thing is that 5 of us (about 7% of the whole class) eventually received PhDs or MDs. We had our 50 year high school reunion a few years ago and most of my classmates showed up (roughly 2/3 of the class). Interestingly half of my high school classmates still live in the area. So I get to see some of them from time to time. I think the Middle West really believed that education was very important. After the Civil War this country took a breath of fresh air and started many colleges for educating the population.

How was the teaching back then? The arrangement was that student moved around. The math teacher had her class, the language teacher had her class etc…I liked all the classes. We had one semester of world history and one semester of US history. My regret is that I studied geography before many of the African countries changed their names. So I don't know all the names of African countries now.

One thing that caught my attention was the striking number of single women who worked as teachers. Many of these women were not married because they lost their potential husbands during the First World War. They were very intelligent women, they taught and they were good at it.

Did any of the teachers make a big impression on you? I can remember all of these teachers and many of them made big impressions on me. I wouldn't say I was especially close to any of them. But you should know that my mother was the president of the school board, so it was not exactly appropriate for me to be close to a particular teacher. I liked the humanity of many of the teachers!

2. *Was going to college far from your family and friends to earn a degree and build a career a highly honorable thing to do back then? As a women what motivated you to do that?*

It wasn't big deal for me going away for college back then! Whether you went 50 miles away or 1500 miles away you still couldn't do your laundry at home. I think in those days the college model was to live on campus. We did not have all the community colleges we have nowadays.

Was it an adventure for you to go to Bryn Mawr College in Philadelphia? Sure it was! I had not interacted much with people from big cities such as New York, Boston etc…So I got to meet people with different social backgrounds and geographic backgrounds. That was fun! Even though the college was not in Philadelphia city but rather in the suburbs, it was still much bigger than York Nebraska for sure. For fun we used to take the train to Philadelphia and get in all kinds of trouble.

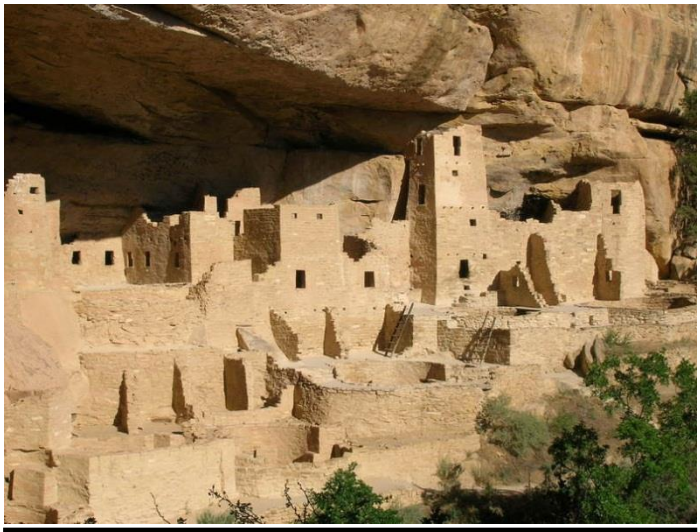
Any challenges in college? College was harder than high school. Most of the students who do well in high school find setbacks in college. I had to take geometry and calculus without having had trigonometry, so I had to teach myself trigonometry while we were taking calculus class! But chemistry was a great pleasure for me in college.

3. When did you decide to go for a PhD and pursue a scientific career?

Perhaps in high school and certainly in college I knew that I was going for a PhD. The reason was very simple: the more education you have the more self-determination you have! If I ask you the same question you would probably give me the same answer. Mostly I enjoy doing science.

One of the events that stimulated my enthusiasm to pursue a science career was when Sputnik went into orbit. That event had a big impact on our nation. Our government started giving high school teachers money to improve their knowledge and instruction, and also supporting students financially to study sciences. There was a lot of encouragement from the government to move competent students into science.

I was always looking for what I wanted to do when I grew up and certainly my parents were encouraging a career as well. We use to take family camping trips in the western part of the United States and we went frequently to Mesa Verde National Park where there are a lot of prehistoric native Indian ruins. At that time I thought it will be wonderful to be an archeologist. I understood that you can ask questions, test hypothesis, solve mysteries with a rigorous way of thinking and I thought it will be pleasure to move into this scientific area. I remember there was a lady ranger at Mesa Verde who told me that if women trained as archeologists they would not be allowed to work in the field. They have to work in the museums. So that kind of turned me away from archeology. But it turned out that was just the experience of people working there. Actually at that time opportunities were rapidly changing for women in archaeology. However, I moved my focus from archeology and considered physics, chemistry and biology. But by seeing archeology I learned about the scientific method. When I got to Bryn Mawr, I chose chemistry because it was very interesting.



One of the ruin sites in Mesa Verde National Park

How did you decide where to go to graduate school? I went to my faculty members at Bryn Mawr College and asked them where they thought I should go. They named most of the best chemistry departments in the country. Actually, when I graduated from high school I chose between going to Bryn Mawr and going to Stanford. You know, east coast or west coast. So I had gone through Bryn Mawr and I

think I still wanted to do the Stanford thing. It was like an unfinished project in my mind! I was interested in Stanford, Berkeley and the new University of California campus at La Jolla. I decided to go to Stanford with its lovely west coast climate, trees, landscape and lifestyle. I had great time there. It was partly a geographic decision and partly a decision based on the excellence of the Department there.

How did you decide about the laboratory for your PhD? I wanted to be a chemist so I only looked at Chemistry departments. Once I had decided to go to the west coast, I visited Berkeley, Stanford and the university at La Jolla (now called University of California, San Diego, UCSD) over Christmas break. I think Stanford offered the highest salary for teaching assistants, plus it was gorgeous. So that was an easy decision for me! Most PhD students, especially in chemistry, are required to teach for two semesters and then they go into research assistantships, and that's what I did. Dr. Carl Djerassi put me on a research assistantship as soon as I joined his laboratory.

4. ***You did your thesis with Dr. Carl Djerassi at Stanford University between 1961 and 1965, a very famous scientist and novelist who contributed to the development of oral contraceptive pills. Did you have fun in his lab?***

I really liked earning my PhD in his laboratory. He was doing very good science and he was very good manager. You could always get an appointment to see him. I should say about Dr. Djerassi, when I joined his lab, that he was 50% professor and 50% vice president for research at Syntex which was located nearby in the Stanford Industrial Park. He really invented guidelines for conflict of interest before the government got involved in defining conflict of interest. There was no overlap that I was aware of between the two jobs he had. He had a big lab with 30-35 people. Many of them were from abroad. He himself had grown up in Europe and he really believed in the internationalization of science. We had large contingents from Brazil and Germany. We also had people from Japan. My oldest friends from Japan are people I met in Carl's lab. That was a very big influence on me, because I still, as you know, enjoying having an international group.

Another thing that I learned from Dr. Djerassi is to have weekly research group meetings. That might seem normal to you, but not all groups do. So when you were a colleague of mine you were enjoying some of the things I learned from Carl Djerassi.

Did Dr. Djerassi inspire you in anyway? Sure, but more than inspiring, he set very good example! I think he taught me how to manage research.

It seems like you had fun during your PhD training. Did you encounter any challenges? No I did not have any major challenges. Carl told me early in my training not to ask the men in the lab to lift heavy solvent bottles for me. I understood and have followed that guideline since. Perhaps writing my thesis was a major challenge, because it was before Xerox and computers! It had to be typed on a good typewriter with carbon paper. It is hard to believe that there was time when we could not Xerox things. So you didn't make any mistakes. All the figures had to be hand drawn. Dr. Djerassi had a draftsman permanently employed by the lab to draw, because he published about a paper a week. The nice thing was that the draftsman drew figures for our thesis as well. Now I find that with a computer I can write much faster and much better, because it is easy to make corrections.

My thesis was away too long, nearly 200 pages. Because organic mass spectrometry was a fairly new field and a new tool for structure elucidation, I had a unique opportunity to review the entire field, and I did of course. We worked on fragmentation mechanisms--how small molecules break apart under electron impact. For my thesis research I made a series of deuterium labeled analogues of amines, alcohols, esters and amides, we were interested in hydrogen transfers, which occur a lot in electron impact. Dr. Djerassi's lab at the time was primarily a natural products lab. Dr. Djerassi also loved developing techniques. He worked a lot on optical rotary dispersion before he moved into mass spectrometry. So by no means were we just a mass spectrometry group; maybe 25% were in mass spectrometry. We had one mass spectrometry instrument from Consolidated Electrodynamics Corporation. The goal of the lab was to elucidate structures of alkaloids and steroids that were extracted from Mexican plants and Brazilian plants. What we really wanted to do back then was to find a faster way to obtain the structures of these small botanical molecules that were potentially pharmaceutically relevant. Dr. Djerassi had worked on the team that invented the birth control pill by extracting terpenes and steroids from a Mexican yam and making critical changes in their structures.

I believe only a few labs had the opportunity and capability to do that kind of work back then? Yes and even fewer labs now because natural product labs are not well supported. Dr. Djerassi supported his research mostly by NIH grants, but I did not have any idea what his grants were like, nor did I really understand how he wrote papers. I mean one paper a week! When did he have time to do all of this?

5. During the years of your PhD training program, a lot was going on: from the Vietnam War, to the golden age of rock music, and the race to the moon. Did any of these distract you from your work?

Perhaps the most traumatic public event for me during my graduate work was the assassination of president Kennedy (JFK). I remember being angry with a Czech person in the lab because initially they said Kennedy was assassinated by communists. This wonderful Czech man was the nearest person to a communist we knew at that time and we all screamed at the poor guy. We were all upset when that assassination happened!

My postdoc period at Berkeley was interesting. At the time Berkeley was much more active in political and social issues than Stanford. I was very glad that I went there as a postdoc and not as a young student; because I think it would have been very difficult for an undergrad student. There was too much going on. Why would you bother to go to class? There was the Baptist minister on one corner and the Black Panther speaker on the other corner. I learned from all the conversations and events that were taking place on campus, but I kept focused on what I needed to do in the lab.

One of the biggest events that happened just a couple of years after you obtained your PhD was the landing of men on the moon (July 20, 1969). Neil Armstrong described that as "one small step for a man, one giant leap for mankind". That was powerful! Can you remember what you felt that day? And if any of this influenced your career path?

I was already in my first job when we landed on the moon. I was an Assistant Professor at the Johns Hopkins Medical School. We all thought that landing on the moon was fabulous. My favorite story is about a British professor in the Department of Pharmacology, who very proudly never owned a television set. But when this moon landing was scheduled he actually rented a television so he could stay up with his children and watch it (Armstrong's first step on the moon was at 02:56 UTC which is 10:56:20 P.M Eastern Time). We went to the moon in that decade. Now we are asking different questions and there are different ways now of getting the answers. We did it partly to show off to the Russians, and secondarily for scientific reasons. Now we are asking questions about Mars and we are sending robots instead of people to get the answers.

6. ***After you obtained your PhD, how did you decide what to do next?***

I started with a postdoc at Berkeley. Why Berkeley? I was married and we had to make a "two career" decision. Because my husband had decided to work more on biochemistry, Dr. Djerassi introduced him to Dr. Dan Koshland who was a preeminent biochemist at Berkeley at that time. Then Dr. Djerassi arranged for me to Join Dr. Melvin Calvin's group, whose lab was also somewhat biochemical. Dr. Melvin was awarded a noble prize in Chemistry in 1961 for discovering the Calvin cycle. His lab was preparing methods to analyze returned lunar rocks at that time. I did not choose to go there because I wanted to work on lunar rocks, but because I wanted to do my postdoc at Berkeley. We practiced our analysis using earth rocks. I produced one paper with Dr. Calvin that was published in Nature (Fenselau et al. Nature 1966; 212:889-89), which relates to how one might prepare lipid samples from the moon rocks. I took a Job at Hopkins before any rocks came back from the moon.

How did you end up at Hopkins? Again it was a "two career" decision. Allan Fenselau interviewed for a number of positions and Hopkins offered him a very good position, and also Hopkins made the best offer to me. I was what they now call the "trailing spouse." But it worked out well for both of us.

When I started in the Pharmacology Department I did not really know what pharmacology was. The Department was called Pharmacology and Experimental Therapeutics. I did not know what experimental therapeutics was either. That was too clinical for me. So to get tenure I had to learn what pharmacology was. I went to the first Gordon Conference on pharmacology, where I met people in the field and listened closely to find out what the problems were and to think about how mass spectrometry and my analytical chemistry skills could contribute. I guess my efforts were successful because I got my tenure in pharmacology.

Did you have graduate students in your lab? They were no graduate students in the pharmacology department at that time so I had postdoctoral fellows. That is probably a faster way to get publications for a new investigator. I got my first postdoc from the network of friends from graduate school. From the beginning I liked mentoring people in the laboratory; however I wasn't comfortable lecturing initially. I lectured to the medical student at Hopkins in a team taught course. It was in the late sixties, when all the students in the country were rebellious. I remember a medical student who sat in the back

row reading the New York Time during my lectures. He is now a famous researcher in a medical school in New York.

7. At some point you went abroad for work! What did you learn? Was it fruitful? What did you find different than in US A?

I wouldn't really call it working abroad. I visited one month in a Japanese university, one month in an English university and couple of weeks in Moscow. I have never taken a sabbatical leave, because I always thought what was going in my own lab was more interesting than what was going in somebody else's lab. Those three foreign appointments as guest lecturer allowed me to meet foreign scientists and students.

Did you learn anything from these trips? Sure. I learned few words in Japanese. I also learned that the stories about crowds crushing you in the Tokyo subways are all true. There are official pushers who push people in and fill up the cars. That was fun! The experience in Russia was very special because it was in 1991, when the Union Soviet was falling apart and there were so many Russian scientists who wanted to go abroad and so many of them were extremely bright and talented. Many of them had been drafted into physics by the Soviet government. When we were there, both my husband Bob Cotter and I met people who subsequently come to work in our laboratories. Bob, as an instrumentalist, had many Russian physicists come to his lab, who then immigrated and stayed in the U.S. It was a nice opportunity for us, and frankly, for our country to welcome those talented scientists. The Japanese visit was also interesting. When I received my Ph.D. 7% of the Ph.D.s in chemistry were women. This can be compared to current statistics in chemistry, where nearly 50% of new Ph.D.s are women. Women chemists were even rarer in Japan in 1976. Dr. Matsumoto invited me as a visiting professor at a women's medical school that had mostly women students. I guess I was good role model.

8. Throughout your career as a scientist you were passionate about the mass spectrometry field and applications. I think you witnessed great progress in this field. From the gigantic instrument with 100 knobs that you need to tweak to optimize the instrument to what it is today-- a bench top high precision and high speed instrument. Can you elaborate on this history and how it impacted your career as an analytical chemist?

Earlier instrument were difficult to use and offered the possibility of contacting an electrical discharge! When I went to Hopkins several people in the department understood that we needed a mass spectrometry instrument, particularly for analysis of steroids. They also encouraged me to find other uses for mass spectrometry in biology, biochemistry and biomedicine research. My job description was to exploit mass spectrometry in support of biochemistry and biomedical research. That was terrific, of course, as a job description. As you know, the automation of mass spectrometry and the greatly enlarged market provided by proteomics has encouraged companies to do much engineering on the instrument themselves and it has become more like a black box tool. What I appreciate is that many

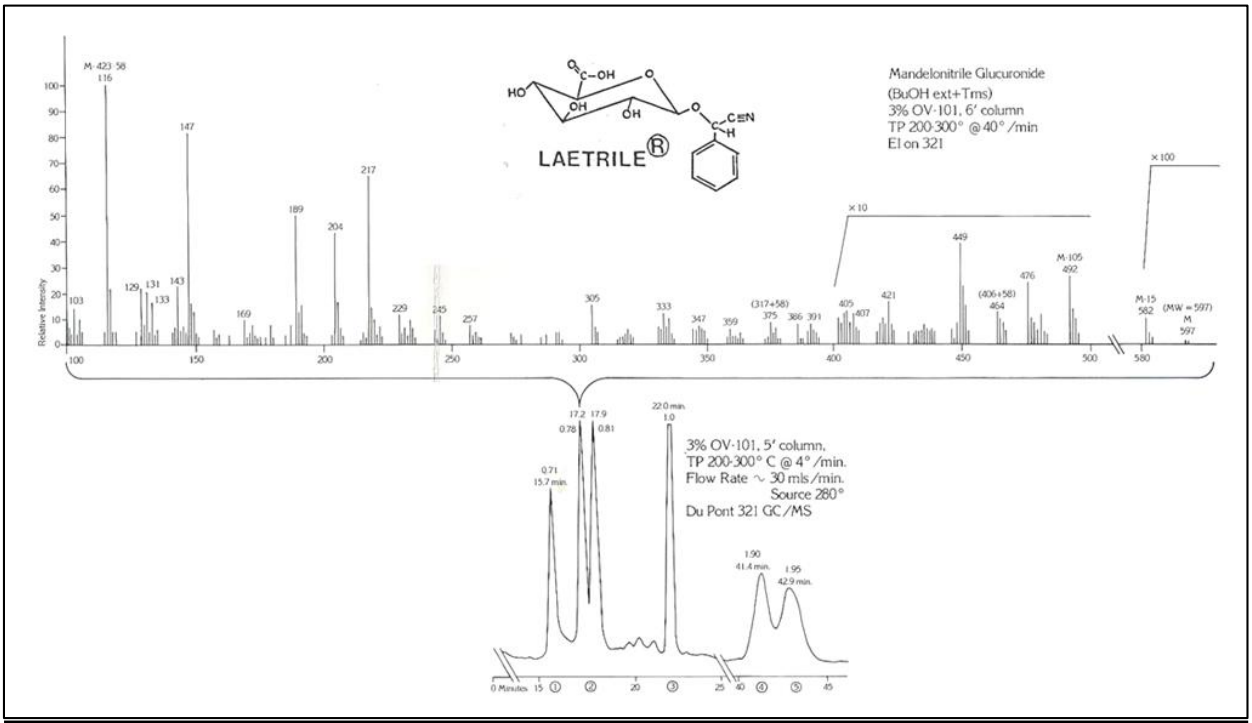
people working in clinical and biochemical research believe now that mass spectrometry is a necessary instrument. So this means that mass spectrometrists at places like Hopkins often work on teams with clinical researchers.

What was your first mass spectrometry instrument at JHU? When I agreed to join the medical School at Hopkins, the chairman of Pharmacology (Paul Talalay) and the chairman of Biological Chemistry (Albert Lehninger) wrote proposals together to NIH and NSF to obtain funding for a state of the art mass spectrometer. They listed me as the scientist who would use it. These guys were really famous and they got grants from both NIH and NSF. They turned down the NIH grant and took the one from NSF because, I think, there was little more money in it! So about a year after I arrived there, we obtained our first CEC 21-110 mass spectrometer from the Consolidated Electrodynamics Corporation in southern California, the instrument was installed and operational and soon I also had a technician to help run it. I did my first projects by driving down to NIH to work in several laboratories there. Dr. Henry M. Fales had an LKB instrument and Bill Landis operated a Hitachi instrument. So I published my first couple of papers at Hopkins using other people's instruments. NIH was very generous in those days about letting people come in to do research.

My first mass spectrometry instrument , aCEC 21-110. Johns Hopkins School of Medicine ~1979

Was your first work on steroids? No. It turns out that steroids do not fragment very well. Alkaloids fragment predictably and reliably. Biemann, Djerassi and other laboratories took advantage of that early on. Dr. Djerassi hoped that mass spectrometry could tell us about stereochemistry and functionalization of steroids, but it was never realized. I did publish some steroid papers in collaboration with faculty members at Hopkins, including a study of the mechanism by which an enzyme moves a double bound in the molecule.

In my own work though, I started with drug metabolism and glucuronidation (see figure below). It was really quite fruitful and it was quite novel at the time. Klaus Biemann said he was pleased to see something new coming into the field. The drugs I studied were mostly anticancer drugs and they did not have chromophores, so you could hardly even do good chromatography on them. GC-MS was my next instrument at JHU. MS of course is a universal detector for gas chromatography. The oncologist O. M. Colvin and I identified the active metabolite of the still widely used anticancer agent cyclophosphamide, and we did a lot of interesting thing with that drug through the following years. We published the first quantification of the drug and its metabolites in urine and blood from patients.



What actually is being sold as laetrile? C. Fenselau, et al. Mandelonitrile ß-Glucuronide: Synthesis and Characterization. Science. 198:625-627 (1977).

Later when I moved to UMBC we had a JEOL four sector instrument which was a wonderful instrument at that time. It had excellent resolution and accuracy. What it lacked compared to current instrument was sensitivity.

How did mass spectrometry instrument development impact your research from the date your started your first job until now? Well now there is less opportunity to develop instrumentation and more opportunity to do work in applications or develop new methods. Probably about the time you joined my lab at UMBC (1994) I was not doing much instrumental development. We tried several special things with the four sector instrument (See Figure) but I was mostly interested in novel applications and methods to facilitate novel applications. You might remember Martha Vestling's polyethylene glycol work. We invented a method for analysis of polyethylene glycol protein conjugates by mass spectrometry. The genome was not sequenced back then and we did *de novo* protein sequencing by mass spectrometry. Another interesting publication from UMBC reported cross-linking of a protein

dimer to elucidate how the protein was folded. As the cross-linking agent you (Y. Hathout) used an alkylating anticancer drug.

UMBC ~1994: Dr. Zhuchun Wu and his baby surrounded by a JEOL four sector mass spectrometer

What do you think about the mass spectrometry field these days? Nowadays mass spectrometry is used by many biological and medical laboratories, and also in space exploration, environmental studies regulatory work, process control. Smart people are going to use whatever instrument provides answers to their questions. I think it is the responsibility of commercial companies who sell the instruments to provide some education, not just to the technicians who will run the instrument, but also to the P.I.s who will be using it. By all means available, our community still needs to teach what the strengths and the limitations are.

Overall, great progress has been made in mass spectrometry and what is lagging behind is the front end (sample preparation/separation methods) and the back end (e.g. bioinformatics). Sometimes it is important to encourage students to check the data manually and do their own interpretation.

9. As a women and a mom was it challenging for you to pursue a career in science?

Sure! There was a double responsibility being a scientist and being a mother at the same time. Fortunately I was able to hire a nanny, someone who was with the children from 8:00 am to 6:00 pm. But it took most of my own salary to pay the nanny. I thought that was worth it because if you dropout of a scientific career track it is quite challenging to comeback. And also I thought it was important to have a good babysitter and good continuity. I think it worked out well.

10. ***Since I joined your laboratory as postdoctoral fellow in 1994 I felt and still feel that you are a very dedicated scientists and great mentor. Not hesitating to tackle some of the most challenging questions and mentor quite a number of students and postdoctoral fellows in different research projects. Just during my time from 1994 to 2002 I counted more than 40 trainees. I believe that you might have mentored twice or three time more than this? That is quite impressive! Was it challenging? Please elaborate?***

Throughout my carrier I have mentored more than 100 graduate students and post-doctoral fellows and maybe about 40 undergraduate researchers. A major reason I left Hopkins Medical School was that I wanted to be more involved in chemical education.

Most of your former students and postdocs are currently professors and researchers. You must be proud of this accomplishment! I'm very proud of you guys! I'm proud of all the students I supervised. Most of them have done well. They are currently researchers in industry, academic and federal labs. One has ended up in patent office and others work in startup companies. That is all great.

Was it a challenge to manage all these people? One way to manage a large research group is by delegating and actually macromanaging the work instead of micromanaging. I had the opportunity to have highly competent people like you in the lab, who helped me teach and supervise others. I learned a lot from the postdocs in Dr. Djerassi's lab. Many of my undergrad and graduate students learned a lot from postdocs in my lab. One thing an advisor should do is to listen to the talented people in the lab. There were some who were good with one team and others with another team, so I let them develop the group. My biggest responsibility is to get grants and funding to keep the group running. Probably getting funding has become more stressful. When I started at Hopkins the percent of success was much higher. I think with the success rate today the number of scientists might level off and may be even go down little bit. This is the era of "self-deportation" for scientists. To succeed, I think one has to diversify. Throughout my carrier I was able to get grants from NIH, NSF, DOD, FDA, USDA, pharmaceutical companies, etc.

What will it take to keep research going in the USA? First, all our politicians need to acknowledge that science is important. Right now more than 1/3 of the population doesn't accept evolution and global warming. So we have to educate more of our population and more of our politicians to respect science. I think we have to get better at teaching science in high school and grad school as well. Remember also that there are other kinds of sciences, not only life sciences, and there is competition for funding between different areas of research.

14. I knew you as wife of Dr. Robert Cotter, another great scientist who made important contributions to the field of mass spectrometry and also mentored a great number of students and postdoctoral fellows (God bless his soul). I have seen you going to conferences and meetings together all the time and yet each one of you had its own way of doing things. Did you inspire each other? Can you tell us a story?

Bob was a remarkable man. He was a great supporter of women in science, including his wife. Even though we worked together at Hopkins initially, we did develop independent careers. We felt that we could make twice as many contributions to science if we had two separate labs and evolved in our own ways that reflected our own skills and our own institutions. After I left Hopkins my responsibilities included more teaching. His responsibilities included more clinical applications and instrumentation. As you know, one of his favorite projects was to design a mass spectrometry instrument to go to Mars and look at the soil for signs of life.

Our personalities and trust in each other let our careers evolve separately, although we did talk about things to a certain extent. Certainly I was proud when he won awards for his contributions to mass spectrometry, because I understood the science and the politics. Understanding so much about each other's professions helped us put up with each other when we were writing grants, publications or something obsessive. It was somewhat similar to a scientist being married to a lawyer, where you have separate careers, however we still did understand the pressure and responsibilities.

Beside science? Actually we did not talk that much about work. One thing we liked to do together was to ride bicycles. For our 10th anniversary Bob bought us bicycles with the intention that we should start exercising and be outdoors exploring. We rode a lot of local paths around Baltimore and then we stated riding along the CO canal where there is a 183 mile bicycle trail starting from Georgetown in D.C. and

A picture of Dr. Fenselau riding a bicycle on the C&O canal path near the canal house

ending in Cumberland Maryland. Then we thought we might find a fishing shack with internet connectivity where we could keep our bicycles along the Canal. We did find a little house that was falling off its foundation. Bob was very good at carpentry and renovation and we fixed up that house. We have 13- or 14 bicycles in the basement so our friends can come and ride bikes with us. We were delighted that recently the National Park Service was able to fix a two mile stretch of the path/bicycle path that had been taken out by a flood 15 years ago. You will remember there is also a cave near our house and Bob loved to take guests to explore the cave and then come back covered with mud!

As you know another hobby of Bob was playing music! He also loved to listen to jazz. Each year he used to host one of the seminars for the Washington Baltimore Mass Spectrometry Discussion Group at Hopkins and he used to invite the speakers and the attendees to have a group dinner at Bertha's in Fells Point not far from Hopkins. He loved to go to there because they often had a live jazz band. He himself also liked to play music and he even composed some humorous songs about mass spectrometry such as "Time of Flight" song.

Dr. Bob Cotter playing the piano during the Conference of the American Society of Mass Spectrometry in Vancouver in May 2012

11. You also served as chair for Chemistry & Biochemistry Departments in two universities, associate editor of the one of the prestigious scientific journals, Analytical Chemistry, and as Interim Dean of the Graduate School and Associate Vice President for Research. Yet you have always continued pursuing research and mentoring students and postdocs with dedication and enthusiasm. You have published more than 360 peer reviewed articles. That is quite an accomplishment! Can you tell us how easy or difficult for a scientist to manage his or her time?

The secret there is that you have to delegate, communicate and have good dedicated people to help. You remember Sharon Morell who managed the Department at UMBC. She did much of the organizing, assigning class rooms, making sure that all the students were enrolled in the right classes. She was also in charge of renovations. So I could save my energy for the academic aspects such as promotions and hiring! Then with the journal I have always had a good editorial assistant, currently Sara Moran.

One of the reasons I left the medical school was because it seemed that there was no more potential for personal growth and no new adventures for me to try. I wanted to try new things. I should mention that I moved to UMBC at the same time that Freeman Hrabowski (President of UBMC) started his very creative program for minority undergraduate researchers. I was fortunate to be one of the original faculty members in the Meyerhoff program. That was a great adventure! UBMC gave me a lot of opportunities and some of my best research was done there.

Did you ever think about going to another state to develop your career further? Whenever I moved, my sons were still in school. The children liked their schools and they had their friends in Baltimore. So it seemed like I should work in universities within 30 miles of Baltimore.

12. *What do you think about publishing or editing books? You have edited several books on the characterization of microorganisms by mass spectrometry?*

I don't think you get much career advantage from editing books or even authoring a book these days. Maybe it is better to publish a good scientific article. With the advent of electronic publishing, suddenly there are twice or three times as many publishing companies and they all want people to organize books for them! I think that is not as quite prestigious as it used to be. Also we see all these new companies that have electronic journals and in many of them I think there is little or no peer review. I personally believe one has to be careful where one publishes. Having your paper reviewed usually improves it! Some universities want their faculty to publish only in journals with high impact. That may be a misguided requirement. Often specialty journals will not have a high impact factor and yet specialty journals enhance communication within a field. Researchers need to be able to communicate across science and also within more specialized areas.

13. Advice from an expert professor: If you want to give advice to young scientists on how to do research, mentor students and postdocs and succeed what would you tell them?

I have seven words. Be creative, stay focused and work hard!