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## **Contact:**

Special Collections, University of Delaware Library  
181 South College Avenue  
Newark, DE 19717-5267  
302.831.2229 / 302.831.1046 (fax)  
<http://www.lib.udel.edu/ud/spec>  
[askspecref@winsor.lib.udel.edu](mailto:askspecref@winsor.lib.udel.edu)

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## Dr. Elizabeth Dyer

[0:00:00]

Dr. Dyer: This is an interview with Elizabeth Dyer who's been on the staff of the University of Delaware for a while.

I came in late fall of 1933 to be instructor of chemistry at the Woman's College of the University of Delaware. At that time, the women's college and the men's college were separate. I was in the department which consisted of Dr. Christina Drake, a marvelous department head and teacher and the best there could be.

I was next in command and then a half time assistant was all the rest of the faculty in the department. Naturally, we could not give every course every year so that we alternated giving say, organic chemistry every year, organic chemistry for majors. But we gave the applied course for the non-majors, the applied organic chemistry every year and it's been my great pleasure to have top it for 38 years at University of Delaware rather at my specialty, the organic chemistry for the non-technical people, the people in home economics and now, nursing and the various other applied people.

Coming as instructor, I've now been professor for a number of years. I want to do a questionnaire that is...

Interviewer: Okay. I was just curious as to the – I've been curious as to the nature of the chemistry department, how it's changed of *[inaudible]* [0:01:47].

Dr. Dyer: The rough – first rough summary of the Chemistry Department Organization, I said that that time, Dr. Drake was head of the department at the woman's college and I really think that we gave a good training to people in small numbers. The Delaware College Chemistry Department headed by Dr. Eastman *[phonetic]* [0:02:16] head a staff of, my guess is roughly not more than five people.

Then in the 1940s, Dr. Mosher *[phonetic]* [0:02:27] was employed to head up the combined department of the consolidation of the woman's college and Delaware College. And, of course, in the – it was in the 1940s that we developed graduate work to our master's degree.

At the women's college, we did not have any even masters work in chemistry. At Delaware College, they had a few masters each year. And

then in the late '40s, we had our first PhD candidates coming up. That's the broad outlines.

Now, I supposed you would like me to compare how it was teaching in the early women's college versus today. There are number of aspects to this. First, I think that we had just as good material to work with in the small women's college as we ever get today. We had some extremely able people.

I think that we gave – I think the courses given in the early days were of high caliber for the standards at that time. At the present time, what one has is a very much greater possibility of choice in elections and in the background of the faculty. Now, of course, one has specialist in the various instrumental areas which were unheard of at the time I started teaching.

Also, the place where I want to begin to now for freshman chemistry is much more advanced than it was in the 1930s because the secondary schools carry people further in their chemistry.

We, in the 1930s, we had the pleasure of knowing intimately everybody in the class which is now impossible. I supposed you'd like comparison of size – class size, in the 1930s, I don't remember exactly, but let's say a big class for my applied organic chemistry, it was called elementary organic chemistry, was maybe in the '20s.

**[0:05:01]**

Last fall, the total number of people enrolled in this class was probably roughly 275, at least, taught not all in one section, of course, which means that last fall, I couldn't possibly know everybody in the class. I couldn't take them all on the picnic as we did in the early days. But I know – I naturally knew well the people who are having trouble and I knew some of the excellent people, but a great many people who are confident and could take care of themselves naturally, I didn't know.

But we still know well, I think, our majors and I had a very great privilege last year of having one of the student assistance to work with me. There are certain number undergraduate students who get scholarships to work as student assistance for teachers where they may do anything to help the teacher from helping to grade papers to working over literature material that might be useful to trying out experiments.

So that the young woman, a Susan Breen *[phonetic]* **[0:06:21]** who work with on this, I certainly know as well as I ever knew anybody in the 1930s. And I think that our chances of knowing people have not disappeared completely although we couldn't possibly know the whole class.

I feel that I knew my advisees pretty well in this fall, at least some of them which is, again, comparable to knowing the whole class in the 1930s.

We had very little equipment to work with in those days. The first thing I did after coming from Yale is to get a magnificent grant of something like \$200 to spend on equipment for laboratory work in our department. We – this was – when I say for laboratory work, it was for special work for seniors.

Even in the early days, we had – we didn't have degrees with distinction but we had honest – with the detailed organization the present time, but we had honest work and had special project. So I worked on weekends with seniors on a little piece of research and I worked with the part time assistant on research that we published even though she couldn't, at that time, get a masters degree for the work.

o that – I think even that very much in those days, we had independent work and I think our teaching, how it was felt that it was of high caliber and that we enjoyed it. Now, we're only teaching all women, now, we're teaching men and women.

I like to teaching all women and I like teaching the next group. It depends on the person. I don't think you can make it any big decisions about preferable to have a segregated education or not. It depends on the nature of the person.

One thing we had is the social conditions. They were, of course, very strict in those days. Women faculty were required and to live on campus. I lived with Ms. Harriet Bailey and Ms. Edith McDowell *[phonetic]* **[0:08:51]** in the little temporary building and had been temporary since 1918 which held about 20 students and three faculty and had a rapid exit from the backdoor to the dining room for breakfast and also a flower garden outside with which we decorated our rooms and the common rooms.

We knew the people in the dormitory very well. But one needed to be strong and young to endure the paper thin walls and the contact with the student after 10 o'clock when maybe the faculty retired since they had

been lecturing since 8 o'clock and also the availability to the dean who might come at 10 o'clock with the problem on our mind.

We also were obliged to get permission from the night watchmen to get into the dormitory when we returned from Philadelphia Orchestra Concert on Saturday night. These are minor details though.

I think that it would have been impossible for a faculty to continue to live in dormitories and carry on the research projects and the heavy administrative responsibilities of various kinds that we have now.

**[0:10:11]**

Maybe you better ask me a question since I'm...

Interviewer: You mentioned there was selection of this.

Dr. Dyer: Yes.

Interviewer: I'm wondering if there has been a change in emphasis on the type of research that you've been doing at the faculty and even the graduate students of Delaware over the years.

Dr. Dyer: Well, in my case, I've had a chance to do the research I wanted to from the beginning on up through with no compulsion as to thou shalt do the essence so. However, when there was an opportunity for a change in the direction of the research in the 1940s which I took advantage of and has had a big influence the subject matter of my research.

At that time – turn off a second – at that time, the Armstrong Cork Company came to the university chemistry department and said, "I supposed you have much to do because your men are all at the war." This is after we were consolidated. Our answer was, we have a great deal to do because we have the navy on campus and we're supposed to teach them everything about chemistry that they might need in six months.

Dr. Drake incidentally did a great deal at the organization of the work and how could you give navy boys a reasonable introduction to chemistry in six months. And we had – we were running degree people in the fall as well as in the spring, we had degree twice a year and we had, of course, work right straight through the summer.

Well, at that time – so Armstrong – our answer to Armstrong Cork was, we are very busy but we're always interested in extending chances for

research, possibly sponsored research. We couldn't – they had asked us if one of us would like to come to Armstrong to get industrial experience. We said, we could not do that but we would be very happy to entertain the possibility of a graduate fellowship where we could work on material of mutual interest.

They said, we will give you – we'll make available one fellowship. So Dr. Colburn who was then – I think they approached Dr. Colburn first as well as Dr. Eastman in chemistry, maybe Dr. Mosher. People were asked, would they be interested in working on rubbers or polymer which the Armstrong people wanted to work on.

Nobody expressed any interests. They got down to me and I said, well, I think I could learn. So thereby began a long and very happy association with Armstrong Cork. I still have fellowships from them which have allowed us to support two graduate students per year, sometimes one.

The conditions of the work have been very elastic that is in the early days, they suggested the field. They want to work down of rubbers. The later, it became a path that it would be better for us to work on subjects that we suggested as long as were in the general field of polymer chemistry which we did and has been my pleasure to have their support for research in polymer chemistry for over 20 years.

The – we've always felt that we could discuss our work openly. And I've gradually learned more about the field because of extreme agreement at the beginning and probably didn't help very much. In fact, the referee of one of our paper said that it's perfectly obvious that Dr. Dyer has not had access to the government reports on synthetic rubber. I will see that she gets these, so that we gradually became are aware of what was being done.

However, when the war was over, the work was bent back to the field that was more in line with my own background that is synthetic nitrogen compound and we worked on the chemistry of nitrogen compounds from a broad point of view that could be useful in polymers. And I also had graduate students working – have had graduate students working on nitrogen compounds of possible pharmaceutical interests.

**[0:15:00]**

So that I have not felt any restraint in the type of research, it's been partly theoretical and partly of conceivable practical interest. Although in

an academic program, you, yourself do not do the testing. You don't expect to do it.

I think I should tell you, however, just for interest, a little bit more about the early days because it deals with local people. The one fellowship from Armstrong, we were seeking candidates to fill it. The best qualified available people, because of the war, were women. We suddenly had application from two brilliant young women from the Women's College of University of North Carolina, Dorothy Levis and Katheryne Levis.

We had only one fellowship but these girls appeared to be so able that Dr. Colburn dug up a second fellowship. And we started our research in polymers with two women. Dorothy Levis eventually became Dorothy Levis Monroe and Katheryne Levis married a historian from New Jersey College for Women at that time *[inaudible]* [0:16:16] University.

So out of that research grew masters degrees at that time with me of two very talented women who have continued to serve in academic and supporting positions through the years. Later, we had both men and women on the Armstrong fellowships and I've had both men and women in research in the meantime.

Now, you asked me - the opportunities for research have very greatly increased since the women's college days.

The equipment, the financial support, the stimulation of colleagues also doing research, the general – the necessity for doing research is here now, where as in the beginning, we did it because we wanted to. I was brought up by a faculty in a women's college who said to me, "If you're any good, Dyer, you can do research in the barrel." So it was part of my philosophy that if you were a teacher of a growing science, you opt to be able to find out a few things for yourself and you should be able to get your students to realize the excitement and the fun of finding out a few things for themselves.

Interviewer: Was there any difficulty in combining the women's college with the *[inaudible]* [0:18:04]?

Dr. Dyer: Yes, there were many heartbreaks at that time with – and notch feeling, I think that I had prefer not to go into the emotional implications of the combination. I think that it had to be done and I believe it was good. But there were many people who were teaching – women teaching at the women's college who preferred to do things in what they thought was a good way than to suddenly be obliged to do it in a different way.

But I think it's not necessary to go into the trauma of the period which was very difficult because the – we were suddenly told that the university would be combined. We – Dr. Drake was chairman of the combined department for the period while we were looking for somebody to develop research in the combined department and to develop the graduate work. And then Dr. Mosher has done a tremendous job of building of that, making the opportunities for all of us much greater.

I think that – well, I'm just not going to talk about the miseries of the combination but say that balance, I think it had become and I think it was good although it hurts some people at the time necessarily. I think that you have to think of the opportunities for students that became available by the co-education university.

**[0:20:03]**

It's not my field, but I'd like to comment on the growth in music because I've always been interested in music.

When I came, there was one person in the music department, a person who taught voice, just one with part time help from Ms. Ella Pile **[phonetic] [0:20:22]** from the Wilmington Music School who taught piano one or two days a week. We've seen through the consolidation of university, it was possible to get Mr. Laudes **[phonetic] [0:20:35]** who worked on development of a much larger department with opportunities in instrument – with instruments, theory, the development of our full major and now with very great pleasure of a, not only stringed quarter, but a woodwind quintet.

All these would have been impossible probably with the finances as they were for the two separate colleges. In fact, Mr. Laudes **[phonetic] [0:21:03]** told me before his death that whenever he needed little money to work with it to go to Dean Robinson and say I need so and so for some more music and you find some and Dean Robinson would dig in some – into some fund that he never heard of, would say, here's your money, go buy some music.

So that – the opportunities and things like that were impossible with the older college. Although I think, as I said, I think the instruction in the traditional studies was excellent. In the women's college, I think instruction in home economics was excellent. I knew very well the people who taught home economics that were well-trained and had excellent ideas, excellent backgrounds. The girls wouldn't have gotten any better instruction in the present consolidated college university except in the



new areas that they can now have. Now, there is much more choice in areas when it shows impossible in the early days.

The big development in other departments – but I think this is not for me to talk about. I'm getting off the field. What else would you like to ask?

Interviewer: What were the – I'm sorry. What were the students like when you first began teaching and how have they changed throughout the years, if that have change?

Dr. Dyer: I think that this is a question that cannot be answered with generalizations. I think that we had students that were just as motivated as the best students that we have today. I think that – I'm thinking of brilliant women chemistry majors of the 1930s where they equal of chemistry majors who are excellent today. That's ability.

Now, we had, as usual, we had people who needed some chemical background but who found it hard. We have the same today. This is not any different.

I have been fortunate in having in the courses I've taught quite well motivated people. I've had less than perhaps over my colleagues to struggle with people who think it isn't worthwhile learning. And I believe it's partly because I've had so much to do with the people with vocational interests. People in the college of nursing, they know what they're going to do.

If you give them things of the biological slant, they eat it up. People in the college of home economics, if you can relate organic chemistry to foods and textiles, they like it. So motivation has not been a problem. Of course, we have – there is one change that was a very recent change and that is with our PhD people, the present worry about jobs is severe. And yet down in the 1930s, I had letters in my file writing for jobs for our competent women, they were scarce, jobs were scarce then so we've return to a job scarcity.

And what people have to do was to find positions in any way they could. The women often added secretarial experience to their chemistry and added accounting for company as a secretary. I could mention a number of people who did that, maybe they stayed as secretaries.

[0:25:02]

At the present time, our men PhDs, of course, must be willing to do anything that needs doing whether it's working on the residues of a chemical plant or a – there are jobs we heard about some today probably working on finishes for a government project that is suddenly been funded.

The men, they have wanted to do theoretical organic chemistry. Now, they must do the applied kind of thing which are girls were having to do in the 1930s. This has to do then with vocational aspects. One have – nowadays, people have to be very willing to turn a hand to whatever needs doing.

You asked if the students are any different. I think I've covered the points of competence, vocational opportunities. This year had been shrinking in specific things. Motivation, from experience, is still good. We have – there is one factor that we didn't have. I believe that the wider opportunities today for students in terms of all kinds of things, radio, television, movies, easy access to big cities, easy availability of man for social events cuts into their time.

I think the students perhaps actually have less time for academic work, or I think they have less time than in the old days where they made their own amusements with picnics, of course, dating naturally. But it's maybe a little harder to get the special project done because the student has so many competing interests.

The very availability of the large numbers of young men provides stimulus that is normal and the girls naturally want to learn as much as they can about the young men, but they're on the feudal time and perhaps it cuts into their actual time for academic work. Yes.

Interviewer:

It would seem that while the *[inaudible]* [0:27:41] for – in the chemical fields have expanded in terms of reaching out and doing more research in areas that were untaught in the 1930s, while that is expanded, somehow student's involvement has decreased?

Dr. Dyer:

I don't think student involvement has decreased. I think we are just feeling the effects of the worry about jobs. Our enrollment in – of graduate students for next year is very much smaller than previous years in chemistry and this is definitely connected with the job situation, I'm sure.

The – up until now, I would say that we had had a very healthy and lively section of student affiliates of the American Chemical Society with good

students, interested students. And there still are more jobs at the bachelors level in chemistry right now than there are at the – masters and PhD levels. This is where the shrinkage is right now. We hope it's temporary because I think in about eight years, there will be a need for trained people, trained elastic people.

We have not so far felt decrease in student involvement. But maybe you should ask this question of somebody else. I have not felt it personally.

Interviewer: Yeah. What I meant was that the – as you said, it seemed to me, I just thought *[inaudible]* **[0:29:37]** the increase in social involvement leads to the decrease in education.

Dr. Dyer: In academic involvement. This might be a trend. The symptomatic of this perhaps, it's not entirely social, it's a desire to get experience of this many kinds as possible.

**[0:30:06]**

But maybe symptomatic of this is the enthusiasm for the winterim program which shortened semesters and left me with really a perceptible decrease in the excellence of the work.

In my course at the end of the first semester, people couldn't quite encompass the work in the time. Their final grades were noticeable less good. We tried to – we knew that the semester was going to be short and then we tried to – I cut a considerable amount of material. But there is a certain basic outline in every course that you still think maybe essential, of course, every year. One perhaps decreases it a little bit more while one puts in other kinds of things.

The students found themselves unable to cope with the shortened semester as well as they did before. And yet the benefits of winterim to people who participate and seemed to have been great enough that they're coping with the shortened semester, again, in next year's program.

So this means less traditional by necessity with a chance for the wider opportunities and the greater experimentation of the winterim period. We are of necessity, it seems to me. We must cover less – human ability can take only so much and the problem is one of choice, how can you make what you have to teach valuable when you have a shorter period to do it in.

I think all of us feel the pressure to be relevant and yet to, if we can, do a decent job of teaching fundamentals. Does that answer your question? I see. Turn off a second.

Interviewer: Could you possibly describe your research in terms that – or lay them that I can understand better?

Dr. Dyer: All right. I think the first object in my research has been to train students. I would put this as the foremost thing. Therefore, I would try to pick projects that hopefully could be of value to young people who had only a limited amount of time to do something.

In chemistry, this means that you must have an ongoing project to which several people contribute. And I like to say right now that everyone of my 50 ad publications has been with students that is I have been – it's been researched through trying to teach the student whether it was in the older days when we did projects with seniors or now when we try to help people to get masters degrees and PhD degrees.

Now, as to the subject matter of the research, in the – I'll describe briefly the very earliest work which wasn't very well done, but it shows you when – in the early '30s, I came here from experienced at Yale with nitrogen compound of possible pharmaceutical use.

So the problem that I dreamed of for the first years was dealing with preparation of amino acid combinations. Proteins are composed of amino acids. I was putting together a certain amino acids in small combinations. They were not proteins but they were combinations of two amino acids that were unusual amino acids.

Ordinary amino acids have amino group and a certain position called the alpha position. At that time, there had been information as to the occurrence in muscle of so called beta amino acids. Hence, the first work I did was with certain combinations using the beta amino acids.

**[0:35:05]**

The reason for doing it, you see, these things had been found in natural tissue. Therefore, further information on how they combined could be of interest. This didn't go very far. This didn't go beyond women's college days, but I think it gave a few people experience in the methods of synthetic organic chemistry.

Then in the days when we started the Armstrong work, there had been the big push for a synthetic rubber necessary because of the Japanese attacks of Pearl Harbor when natural rubber became unavailable. Some of you might be interested in – sounds like a lecture if you were class had over the lifetime.

The fact that the synthetic rubber business was very much aided by the work of Jack Gerster in chemical engineering and the distillation tower which up until last year was outside my window of the chemistry. Jack Gerster was given the job of finding out how to purify butadiene, one of the major constituents of synthetic rubber. You had to get it from a mixture of stuff that came from the petroleum refinery.

How could you get that one thing, that one hydrocarbon that was essential for synthetic rubber? Jack Gerster worked out the process here at the University of Delaware with his distillation tower. And within a few months, the process went to the Rubber Reserve Corporation and the factories were working making the necessary polymers for the synthetic from Jack Gerster's process of purification.

Well, that was on butadiene. A very close relative of butadiene called isoprene is what is in the natural rubber plant. The Armstrong people suggested that I should try to make some rubbers that had isoprene in them. At that time, we didn't know enough to duplicate natural rubber. This has since been done and now, synthetically a polymer that is the equal of natural tree rubber can be made.

My work was a very simple one. We took the isoprene which we go from purchase. It was obtained from breakdown of turpentine at that time and combined it with another chemical important in the synthetic rubber industry called styrene.

We were studying what it took to make isoprene and styrene go together to make a polymer which is a very large molecule of many units. Our polymers were very poor. They were not usable – their properties were unsuitable and all we learned were some of the principles of polymerization, some of the principles of using the catalysts that were then available. We tried to do somewhat of a systematic study. That was not very good at the time.

So, when the next set of students came along, we stopped doing the rubber work which was being so much better done by the rubber research people at Akron and a number of other places and started doing preparation of polymers that could be of interest to enter – to industry.

Actually, I have one patent. Most of the work we did was of no use and the patent has never been used as far as I know. I think that our work was fundamental and not in any sense development work.

We took styrene. It is very useful and very versatile compound and studied its reaction with other compounds having reactive groups. And you probably don't want me to go into the details of these other compounds, but I will say that a series of other compounds differing in nature is here for a good many masters and PhD theses.

We studied the conditions for making the polymers, the size of the polymers, their properties, how they stood up to acids and bases and so on so that the young men had experienced in synthesis and studies of reaction using the tools that were then available.

**[0:40:06]**

Well then, soon after we were became consolidated, we utilized the Wilmington chemists to help us with ideas for research. One at Hercules suggested to me – I'm starting and I can remember what his name is, oh, dear. Well, anyway, it was suggested to me that perhaps isocyanate chemistry was going to be important.

Well, this appealed to me because it – the isocyanates contain nitrogen. I've always been interested in nitrogen chemistry. It was suggested by Dr. Sperlin *[phonetic]* **[0:40:52]** of Hercules that some basic work on isocyanate reactivity could be of use.

So a woman masters student in the 1940s did some rates of reaction of the simplest isocyanate, phenylisocyanate, with simple alcohols, the low-molecular weight alcohol, just propyl alcohol, one – it's two isomers. And she found out by a certain technique that we could measure the rates of reaction and we found out that one kind of alcohol reacted faster than another and this worked. Actually, it was of later help. This was entirely theoretical but it became of help to the many people who subsequently used isocyanate chemistry in the formation of a great many plastics that go by the name of polyurethanes.

Well, having gotten into isocyanate chemistry, we did have problems on this for good many years partly with Armstrong's support and partly without. Then we were always hard up for funds to support graduate students because graduate students have to eat, too, and we did not have enough teaching assistant just to help them with their living

expenses, so we were all urged to seek government funds to help finance the living expenses of the graduate students.

I had some funds from very – a few years from the National Research Council and then from the – later, from the public health service. The National Research Council funds at the very outset which were not for very long, where basic study of the effective oxygen on what happened to certain important monomers with oxygen. And we took as our monomer, acrylonitrile which happens to be the thing that makes the fiber Orlon [*phonetic*] [0:43:11], many thousands of people work on these monomers, so our little work was just what happened to it under certain conditions.

Then I subsequently applied for grants from the public health people, from the National Cancer Institute suggesting projects that would combine my own interests in nitrogen chemistry, synthetic nitrogen chemistry with their interests in compounds that might possibly of use in cancer chemotherapy.

This, as you know, has been a big effort of the federal government over a good many years. They felt that they could not afford to leave any stone unturned if they could alleviate this disease. They knew that a certain nitrogen compound called a purine that's certain of its derivatives were helpful in treatment of leukemia in children which is one form of cancer. It's one of the few forms in which chemotherapy has been – had a reasonable success, not as a cure, I guess we still have no cure but, at least, for regression of symptoms for enough years to make it worthwhile.

So I wrote projects involving derivatives of purine which my students should prepare and then they were evaluated by the testing services at the National Cancer Institute.

None of our compounds turned out to be as good as the ones as that were currently in used, but it resulted in the publication of a number of papers on the organic chemistry of the types of materials that we worked out.

[0:45:16]

Actually, I had public health support for 10 years which was greatly appreciated for the purchase of chemicals, the purchase of equipment. Each of us naturally were expected to contribute to the department stock

of instruments. Chemistry is very expensive nowadays because you must have so many instruments.

We purchased the instruments by contributions from the various project to get a modern properly equipped chemistry department which, of course, meant that a training for our students to use the kinds of instrument that they would have when they went out into their jobs and for us to do better research because we could monitor our results more properly.

So I have been interested in the possible beneficial effects of the nitrogen research but cannot claim that we got anything that was of great value to mankind. I have to hope that our research fits into the whole picture of organic chemistry research and that our training has been useful to people who've gone on which I think it has.

But you can see that I've never felt any compulsion to do work that I didn't want to do. I did work that I didn't know anything about a number of times and then learned along with the students. But isn't this what is proper for all of us to do?

And then I felt that it reached my teaching to have had experienced – actually had experience with different kinds of classes of compounds which I could then talk about with enthusiasm because I knew their significance in the whole picture of the use of plastics and the medicinal product.

Interviewer: Is the chemical *[inaudible]* [0:47:14] the chemical world the cooperative world or the competitive world?

Dr. Dyer: Oh, I think the – I think the chemical world has the academic. You asked if it's competitive. Well, I'm sure – through the American Chemical Society, there's been a tremendous amount of cooperation. It's competitive in the sense, one may not published anything that is not new as in any field. There is a premium on newness.

It's got to be either work that hasn't been done before or new results on old compounds and so it's competitive and that you hope that somebody else doesn't publish your result before your student gets it done. But you go to conferences and you talk to people and you try – and you find out what people are doing and you hope to fit in.

Many times I've ever asked anybody in either industry or academia for advice on a project. I've had a very favorable reply. In industry, if they



cannot – if they happen to be working on the same project, of course, they will say – well, we're working on this, too. And this is a warning to me that I have to watch out because I don't intend to compete with industry and never have wanted to compete with industry although I have accidentally done so many times because of the rapid industrial development in the same kinds of chemistry that I was doing.

But where the academic profession – the ACS, American Chemical Society has committees that have worked on the improvement of instruction and have tried hard to bring another thing that the American Chemical Society has tried to do, not all of us have taken advantage of it, but great many have is reeducation of older people, so necessary in a growing science.

We all run like rabbits to try to keep up in the small piece of this subject. So the American Chemical Society runs a chemical assist in new development. The government has had a good many training sessions for older faculty folks, have been to some of them, to try to refresh us because obviously, we don't know as much as we thought we did when we came out fresh from our PhD.

And I think that chemists are cooperators even though naturally they are competitive in terms of one person would like to get a new idea that somebody else hasn't thought of and developed it into something exciting.

**[0:50:14]**

But my work has not been of that character, I mean, mine has been more a pedestrian in not trying to – mine has not been extremely theoretical. I'm not the person who's produced the brilliant theories that open up hundreds of new lines of work. I can't claim to that. My work has been more or less using the older and the current theories with new compounds to try to educate a few students.

Interviewer: Have the opportunities for women in chemistry change over the years?

Dr. Dyer: Well, I'm on the women service committee so that I should know something about this. It's going to be – it's the women's chemist committee of the American Chemical Society. I think the opportunities for women – you look at the 40 years that I've been in it have definitely increased.

I was very lucky in being supported in my graduate work at Yale by a professor who believed in training women and arranged for us to do to be what he called research assistants. At that time, we were not permitted to teach the Yale boys. Hard. So this – the opportunities for women in teaching chemistry have certainly expanded. It was unheard in a men's college in the earlier days.

And I think it was also a shock to the people in Delaware College when they inherited Dr. Drake and me as members of their department. It seemed to go on – with relatively painlessly we – but certainly, the opportunities for women in teaching have greatly expanded.

The opportunities for women in graduate work in chemistry are certainly excellent in most places now. However, there is a bit of this residue that I heard about. One of my very good undergraduate students who went to her college in the Middle West that shall be nameless to do PhD work in an extremely well-known university went her rounds to consult faculty for projects when she wanted to start a PhD work.

And she was horrified to find that one of the best known man in the department said to her, "I'm just not going to consider your application. I would not take a woman under any circumstances because all women do is get married and it's not worth the \$10,000 that it really would cost to educate you as a PhD."

So there is somewhat of that residue of thinking in some universities and no doubt in some industries as well. I've not met it here. I've had equal opportunity with the men in every respect. I've had every encouragement to be independent and to teach the subjects I want to teach, to do the research I want to do, to get the grants, to have the students.

There has been not the slightest restriction in opportunities for me. And I think that's the case with women of my generation unmarried who made their place in both in industry and in academia.

The problem comes with the married women and marriage is very normal and, of course, we should expect our women to have all the benefits of marriage as well as the stimulation of professional life. But this makes a problem because most universities hire people one at a time. They want Mr. X to fill a certain vacancy in a certain department and probably there isn't a vacancy for Mrs. X in her specialty in her department at the same time. These are rare.

Hence, the chance for a woman to get to do – get her own professional satisfaction, the young married woman has a real problem in finding an equally satisfying professional position, the same time that her husband does.

**[0:55:11]**

And then we have – there's a little bit of the nepotism rules in some universities. I think this is disappearing and I think it will disappear more in this day and age with the efforts of the universities to avoid discrimination due to sex as well as due to race.

But women as well as men face the unemployment difficulties at the present time and we have certainly had a great deal of a complaint from the young women trained as PhDs in the scarcity of positions at the present time.

I think this is not sexual. I think it is overall the PhD problem right now because I think the – I think it's an individual one, you in industry want a woman who will presumably stay and grow as they want a man or stay and grow and the married woman has the problem there of what is she going to do about her life.

I have known cases of married women who have raised their families and then have gone back to research in very satisfying positions and I think this is the way for a married woman to do it. I think they need the initial training to get the steam to know that they can do chemistry, they can enjoy it, they can contribute and then do whatever compromises as to family are desirable and necessary and then return to their professional and therefore his.

Retraining? Sure, they have to be retrained but their brains are as good as they ever were. And if they're smart and ambitious, they will retrain. With the success of one of my friends who went to back research in her late 50s with great fear and her supervisors said to her, "Why Mrs. X, you learned in three months what it takes the young people three years to learn. How did this happen?"

Well, she had had to be efficient all her life. She'd raised a big family. She had adopted the circumstances. She learned how to use her time. She had read. She had – she hadn't lost any of the personal characteristics she had at the start. I don't suppose this answers your question but it gives you some of the thoughts that we older people have. Now, what else can I tell you?

Interviewer: Is chemistry going to advance? Does chemistry going – obviously changing or continue? I'm referring particularly to the emphasis, at least, publicize that. This is the ecology nowadays and the environment.

Dr. Dyer: Well, I think that in the introductory courses where we have large numbers of non-specialist, I think we must be relevant in certain amount of the work. I think – I think this is essential. In science, one has to be up-to-date anyway. This is one of the things that is a hard task master.

In a science, you must try to be aware of what's going on and I think we must try to show our people the – not only the applications of chemistry but we must warn them of the dangers of people who know too little and try to apply the truth of the knowledge to complex situations.

I think one of the things – best things we must teach our students in college anyway is that there is no such thing as a simple question in today's life. If you make one decision to perceive with a certain course of action, you have to face up to the chain of consequences about which you probably don't know enough and to try to learn everything you can about the consequences that go with the certain type of action.

And if we can – if we can get this across through science, that if you add asset as a certain point, one thing will happen. But other things you can't do because you've done this. You make your choices and follow through best you can with your choices.

You use a certain insecticide, hopefully you are attacking what you want to attack and not everything else.

**[1:00:00]**

But you better watch insecticide as to what happens to it, the whole story from start to finish and you better hope that you've done enough testing to know what you should know. I think that the whole trend these days is to realize that we are ignoramuses, that we haven't known enough about the consequences of our actions, that we must clarify our goals and we must try to preserve life in all directions as well as possible.

And if we don't get this across in our science courses, we're doing a bad job. I think all of us who teach science courses feel that it's very important to teach the necessity for detailed knowledge as to the consequences of our actions in all areas.

Now, we are also confronted with the fact that in training majors, we better give them some specific information as to current theories and knowledge or they can't cope with specific problems. So both must be relevant and we must be systematic.

**[1:01:14]**

**End of Audio**