Oral History Project
Interview Transcript

Christine Ayoub
Interviewed by Linda Arntzenius
May 10, 2014

Institute for Advanced Study
The Shelby White and Leon Levy Archives Center

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Date: January 19, 2016

Linda Arntzenius: All right. Yes, if you want to say a few words. Just give me your name.

Christine Ayoub: This is Christine Williams Ayoub[1].

Linda Arntzenius: Yes, it's working perfectly. Splendid. Well first of all, I just want to say that it's May the 10th, 2014, and I'm here at the home of Christine Williams Ayoub to record an interview with her about her association with the Institute for Advanced Study. And so that you feel comfortable to speak candidly, I will say that we have a consent form and you can embargo any material for a period of your choosing.

Before we start talking about the Institute, could you just tell me a little bit about your childhood, where you grew up, who your parents were, and how you came to your subject of mathematics.

Christine Ayoub: I was actually born while my father[2] was at Cornell, but I was born in Cincinnati, Ohio, because that's where my mother came from. My mother went back there when I was born as she had when my sister Hester was born two years before. Then when I was about two, my father got a position at McGill University at Montreal and I spent most of my childhood there. However, my first school--I don't think you'll believe this--was an Italian school in Rome. My mother got tired of Montreal winters and decided that she was going to spend the winter in Italy. She took me and my sister Hester and tried to rent an apartment in Rome. She wasn't successful, so she put us into an Italian boarding school and so I learned to read in Italian.

The year that we went there was 1928. And the reason that my parents chose that year was because it was the year of the International Congress in Bologna. I bet I'm the only person that you've interviewed who was present at the International of Congress in Bologna. When I came back to Montreal, I went mostly to English schools, but I spent three or four years in French schools. My father thought it important to teach young children foreign languages. Even though he was a mathematician, he went to Haverford and majored in classics.

Then he got a Rhodes scholarship and went to Oxford and at that point he changed from classics to mathematics because he thought he was maybe a bit better at it. To continue with my father, after he got back from Oxford, he used to go in the summer to the University of Chicago to work for a Ph.D. As he said, the University of Chicago was even better in the summer than it was in the winter because they got a lot of guest mathematicians.

[1] Christine Williams Ayoub, Member in the School of Mathematics, 1947-1948.
[2] William Lloyd Garrison Williams (1888-1976).

He wrote his Ph.D. thesis with Dickson, L.E. Dickson[3]. When he had obtained some results on a problem he was working on he sent a report to Dickson. Dickson wrote back and said that's enough for a Ph.D. thesis.

Linda Arntzenius: Wonderful.

Christine Ayoub: My father taught for a year at William and Mary and at Cornell for several years. The rest of his time was spent at McGill. Now coming back to me *[laughter]*, after I graduated from high school, I felt sure I wanted to study mathematics in college. My father didn't think it would be too good an idea [for me] to be at a university where he was in the mathematics department. So I went to Bryn Mawr College. Unfortunately, I just missed Emmy Noether[4]. When she came from Germany, she had gone to Bryn Mawr. But in 1937, she had an operation and [although] it didn't seem to have been a very serious one, she died. I didn't go to Bryn Mawr until two years later, which was 1939.

The head of my department was Ana Pell Wheeler[5]. She was the first woman to give the colloquium lectures, the most prestigious lectures of the AMS [American Mathematical Society]. They probably have been given by women since--I don't really know. But she was a very fine mathematician. Most people didn't think her a good teacher, but I did. She never really lectured. She just talked about the subject in such a way that you--or at least I--got a better feeling for the subject than if she had been a polished lecturer.

When I graduated from Bryn Mawr, I went to Radcliffe for a year, and there I encountered what I'll call--reverse discrimination--because at that time, all the undergraduate courses were taught at Radcliffe and that included some advanced undergraduate courses. I took two of those and had Harvard faculty, whereas if I had been at Harvard, I would have had [i.e. been taught by] a graduate assistant. Two of my lecturers were from Harvard. Saunders MacLane[6] was a wonderful teacher and a fine lecturer.

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[3] Leonard Eugene Dickson (1874-1954) was one of the first American researchers in abstract algebra, in particular the theory of finite fields and classical groups. He is also remembered for a three-volume history of number theory: *History of the Theory of Numbers.*

[4] Amalie (Emmy) Noether (1882-1935), Visitor in the School of Mathematics, 1933-1935.

[5] Anna Johnson Pell Wheeler (1883-1966) is known for early work on linear algebra in infinite dimension, which later became a part of functional analysis. In 1918 she became an associate professor at Bryn Mawr College, becoming head of the mathematics department, and a full professor, in 1925. She retired from Bryn Mawr in 1948.

[6] Saunders Mac Lane (1909-2005), Member in the School of Mathematics, 1954. Mac Lane is regarded as one of the most influential American mathematicians of the 20th century. He was elected to the National Academy of Sciences in 1949 and received the nation's highest award for scientific achievement, the National Medal of Science, in 1989. The author or co-author of more than 100 research papers and six books, his *A Survey of Modern Algebra* was for years the leading textbook in its field.

He even graded our homework papers, making helpful comments. It was because of that class that I decided to concentrate in algebra. Mrs. Wheeler had wanted me to concentrate in analysis because, as she said, not many women had the ability to. I was gratified by her confidence in me, but I didn't feel that her reasoning was very convincing. The other Harvard faculty member I had for a Radcliffe course was Hassler Whitney[7].

Linda Arntzenius: He was later at the Institute.

Christine Ayoub: Oh, yes, I know he was, but he wasn't at that time, obviously. He was at Harvard. He used to come over [to Radcliffe] with blue chalk on his face. At Harvard they were trying out white blackboards with blue chalk. He certainly wasn't a polished lecturer, but he had the ability to impart the subject matter. This, of course, was during the war. The next year, I decided to go back to McGill, because at Harvard, you didn't write a thesis for your M.A. I got an M.A. from Harvard, technically I got an M.A. from Radcliffe, but there was a statement that it was equivalent to a Harvard M.A.

That was quite an exciting year because my father and a group of others were starting the Canadian Mathematical Congress. Have you ever heard of the Canadian Mathematical Congress? Their first meeting was in 1945, which was the year I was there. One of the people who came up to advise the group was G.D. Birkhoff[8]. I didn't mention G.D. Birkhoff when I was at Radcliffe, but I was invited to dinner at the Birkhoffs'. I'm not quite sure why. All I remember about it is that I got a very nice note from Mrs. Birkhoff saying that she was penning me a note--very old-fashioned language.

I remember going to a colloquium once that Birkhoff gave. I was talking to somebody afterwards who said to me [of Birkhoff], "You can see that there was a great man at work there, but you wonder what the hell he was working on." *[laughter]* He wasn't a distinguished lecturer. Maybe you've heard of that. I've been interested in reading that he almost came to the Institute.

Linda Arntzenius: I didn't know that.

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[7] Hassler Whitney (1907-1989), Professor in the School of Mathematics, 1952-1957; Emeritus Professor, 1977-1989. Whitney was one of the founders of singularity theory and did foundational work in manifolds, embeddings, immersions, characteristic classes and geometric integration theory. He was at the Institute from 1952 until 1989 (professor emeritus from 1977). In 1976 he was awarded the National Medal of Science, in 1983 he received the Wolf Prize and, in 1985, the Steele Prize from the AMS.

[8] George David Birkhoff (1884-1944), considered one of the most important leaders in American mathematics in his generation, is best known for what is now called the ergodic theorem.

Christine Ayoub:	Oh, didn't you? He seemed to have vacillated a lot. It wasn't quite known why he finally decided not to come to the Institute. Flexner[9] wanted Birkhoff as sort of a chair of the School of Mathematics, but eventually Birkhoff decided to stay at Harvard.
Linda Arntzenius:	Interesting. I wonder if he knew – if Veblen[10] had anything to do with that.
Christine Ayoub:	I think Veblen recommended Birkhoff, but it had the effect that when Birkhoff didn't come, Veblen took his place. Birkhoff came up to Montreal and, if I remember correctly, Birkhoff had just been down to Mexico to advise them. That's the recollection I have, but I do know, and you probably know this, that he had rather a reputation of being anti-Semitic.
Linda Arntzenius:	I didn't know that.
Christine Ayoub:	Did you know Kaplansky? [11]
Linda Arntzenius:	No, I'm sorry. I'm not a mathematician.
	I'd love to ask you how you came to be one of the first women mathematicians to be Members at the Institute?
Christine Ayoub:	Although I got my Ph.D. from Yale, I wrote my thesis with Reinhold Baer[12] with whom I had studied at the University of Illinois. I would have written it with the algebraist, Øystein Ore[13], except that he was on leave

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[9] Abraham Flexner (1866-1959), IAS Director, 1930-1939.

[10] Oswald Veblen (1880-1960), Professor in the School of Mathematics, 1932-1950; Emeritus Professor, 1950-1960.

[11] Irving Kaplansky (1917-2006), Member in the School of Mathematics, 1948-1949, 1956-1957. In reviewing this transcript, Professor Ayoub clarified with respect to Kaplansky and Birkhoff's reputation: "The Wm. Lowell Putnam exams were given each year to college upper classmen, usually seniors. Each college could enter a team of three people to represent the college. Individual students could also enter the competitions and take the exam. The college whose team came out ahead one year made up the exam for the following year. For many years, the University of Toronto and Harvard alternated in coming first. The individual who got the best grade on the exam was given a fellowship to Harvard. Irving Kaplansky was a student at Toronto who won the Putnam competition (i.e. got the highest grade on the Putnam exam). The year I was at Harvard he [Kaplansky] was on the faculty. I took a course in differential geometry from him even though I was an algebraist. I remember that Birkhoff said some rather derogatory things about him. But Birkhoff was completely mistaken. Kaplansky had a long and very distinguished career. I think that Birkhoff was exhibiting his anti-Semitic prejudice. Kaplansky was Jewish. Of course, I may be wrong about Birkhoff."

[12] Reinhold Baer (1902-1979), Member in the School of Mathematics, 1935-1937. Baer was a German mathematician known for Baer rings and Baer groups.

[13] Norwegian mathematician Øystein Ore (1899-1968) was Yale's Sterling Professor from 1931 until he retired in 1968.

that year. Nathan Jacobson[14] joined the Yale faculty the next year. Actually, he acted as my outside examiner. In the spring of the year I got my degree I went out to Urbana to consult with Prof. Baer. Oscar Zariski[15], who was a visiting professor suggested that I apply for an ONR, Office of Naval Research, fellowship and go to the Institute for the year. Well, I applied for it and, probably with his help, I got it.

But I was very naive. Since I got this fellowship to go to the Institute, it didn't occur to me that I had to apply for membership. I turned up at the Institute where I wasn't a Member. I looked very young, although I was 25, but I think I probably looked quite a bit younger. The lady in housing, whose name was Miller[16], was sure I wouldn't be made a Member. So I couldn't have any housing. But eventually, I was interviewed, but really it wasn't an "interview," by Hermann Weyl[17]. I was scared to death, but actually we had a very nice conversation. I don't think mathematics was ever mentioned.

Linda Arntzenius: How extraordinary.

Christine Ayoub: He recommended me and I became a Member, but by that time I had gotten myself a room in Princeton.

Linda Arntzenius: In the town?

Christine Ayoub: In the town. And there's sort of an interesting story about that. The summer before, I was at a seminar of the Congress in Toronto, and Loo-Keng Hua[18], who was a Chinese mathematician, was there. He was at the Institute the next year and he decided that he'd help me get my room. The result was that every time he came with me and said he wanted a room for his "girlfriend." *[Laughter]* I couldn't get a room. I did get a room eventually, but he wasn't around at that time.

Linda Arntzenius: So where did IAS Members stay in those day?

Christine Ayoub: There was housing. What was sort of interesting is that when my mother visited several months later and stayed for several weeks, Miss Miller

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[14] Nathan Jacobson, (1910-1999), Member in the School of Mathematics, 1934, 1937.

[15] Oscar Zariski (1899-1986), Member in the School of Mathematics, 1934-1935, 1960.

[16] Bernetta A. Miller.

[17] Hermann Weyl (1885-1955), Professor in the School of Mathematics, 1933-1951; Emeritus Professor, 1951-1955.

[18] Hua Luogeng (Loo-Keng Hua) (1910-1985), Member in the School of Mathematics, 1946-1948; Visitor in the School of Mathematics, 1980.

gave her a room in the Institute housing. Where she stayed was in the childcare center. I guess Miss Miller felt bad because she hadn't given me a room, so she decided to give my mother a room.

Linda Arntzenius: Now, did you know that your father had written to the Institute's Director?

Christine Ayoub: Yes, but not about me, I don't think. I know that he wanted to visit Aydelotte[19] about something else[20]. Aydelotte had just retired the fall I came to the Institute. The Aydelottes invited me and my mother to Sunday dinner. Aydelotte was very informal and likeable. I remember that after dinner, he got down on the floor and played with his dog. The [Institute] staff were horrified at having Oppenheimer[21] because he wasn't the same type at all. He [Oppenheimer] was quite aloof.

Linda Arntzenius: So you didn't know Aydelotte before you came to the Institute?

Christine Ayoub: No, I didn't know Aydelotte, but I'll tell you a little story about Marston Morse[22]. He was on the Cornell faculty at the same time as my father and a group of them were getting together to go to lunch. Somebody said, "Where's Williams?" And the other man said "He's coming, I hear Morse talking." *[Laughter]*

Linda Arntzenius: Oh, that's funny.

Christine Ayoub: I don't know whether I met him [Marston Morse] at the Institute or not, but I certainly didn't see much of him. I'd actually wanted to work with Emil Artin, who wasn't at the Institute but was at Princeton.

Linda Arntzenius: Did you manage to do that? Did you work with him?

Christine Ayoub: A bit, but it turned out that he didn't believe much in girls.

Linda Arntzenius: That's very sad. I know that Princeton University didn't admit women at that time.

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[19] Frank Aydelotte (1880-1956), IAS Director, 1939-1947.

[20] In reviewing this transcript Prof. Ayoub added: "My father came to see Aydelotte because he wanted to get a grant from the Friends General Conference (FGC) for some Friends lecturers he was initiating in Montreal. I know Aydelotte approved the grant. I imagine he was on the board of the FGC. Aydelotte and my father had been Rhodes Scholars at the same time and had known each other for many years.

[21] J. Robert Oppenheimer, (1904-1967), IAS Director, 1947-1967; Professor in the School of Natural Sciences, 1966-1967.

[22] Marston Morse (1892-1977), Professor in the School of Mathematics, 1935-1962; Emeritus Professor, 1962-1977.

Christine Ayoub: I know that Artin said there aren't any women mathematicians, and somebody said, "What about Emmy Noether?" You know what his answer was? "She wasn't a woman." Have you ever seen a picture of her? If so, you'd see that she wasn't exactly feminine. Artin had worked fairly closely with her and I think she influenced him quite a bit. I went to his course and I learned a lot from him, but it wasn't too good a relationship.[23]

Linda Arntzenius: So as a young woman mathematician, did you feel that there was an atmosphere that was pushing against you?

Christine Ayoub: At Bryn Mawr, where I did my undergraduate work, we were always encouraged to pursue any study that we wished. I wasn't ready for some of the prejudice I encountered later. However in most cases, I plowed ahead. Probably the experience with Artin was the worst one that I had. The first year I was at Yale I registered for a course with Nelson Dunford[24]. After the first meeting, he took me aside and what he essentially said was that I'd better tend to my knitting. Dunford was a bit of a joker but I didn't know it at the time. At the end of our last class he announced that he was giving us a six-hour exam. I was terrified; we had been reading and researching many papers and I knew I could pass a test on them. Bert Yood who was the only other bona fide member of the class, reassured me. Then a couple of days later I met Dunford at the Yale cafeteria; he thanked me for my contribution to the course and said that by the way, he was excusing me from the exam. Actually, I don't think there was an exam. The next year he asked me to write up the notes for a course he was giving.

Linda Arntzenius: Interesting. So he came around?

Christine Ayoub: He came around, but obviously, he started with a prejudice against women. I think he thought he was doing me a favor by telling me I better not take the course. But I decided I've come there and I was going to – [*Laughter*]

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[23] In reviewing this transcript Prof. Ayoub added: "Although I had not applied for membership at the Institute, I had communicated with Artin. The subject that I wrote my thesis on was kind of a dead end topic which I'd more or less solved. In fact, I later published a couple of papers on it but that was after my time at the Institute. I was sort of looking for a new area of research and hoped that maybe Artin would guide me but he had no interest in me. He didn't know me well enough to know what my abilities were. What he did know was that I was a girl. I think that like many mathematicians Artin considered it a waste of his time to help women students. It wasn't so much that they were less able but because they would get married and have children and give up mathematics. My thesis adviser visited us the year we were at Harvard and he was quite unhappy that I wasn't too involved in mathematics. My grandmother was an artist and studied with Frank Duvececk--she was one of the 'Duvececk girls' and the only one who continued painting after they got married. My grandmother continued painting for the rest of her life. In 1998 and again in 2012 a New York Gallery mounted solo exhibitions of her work. My mother, who had graduated from the Cincinatti Music Academy and had studied in Berlin, was a fine pianist. She continued playing all her life, but not professionally. Her teachers may have thought they had wasted their time teaching her."

[24] Nelson Dunford (1906-1986), Member in the School of Mathematics, 1946.

Linda Arntzenius: So you spent a year at the Institute?

Christine Ayoub: Yes.

Linda Arntzenius: And what did you work on, do you remember?

Christine Ayoub: Not exactly, I don't really[25].

Linda Arntzenius: But you spent some time taking a course from Artin?

Christine Ayoub: Yes.

Linda Arntzenius: And what about the mathematicians at the Institute? Who did you interact with?

Christine Ayoub: I interacted more with some of the temporary Members. I went to lectures by people at the Institute, but I didn't work with any of them. In retrospect, I think I went there too early. It would have been better if I had gone three or four years later when I was somewhat more established, because I had written my thesis in group theory and there was nobody in group theory there. I learned a lot from Artin, but he was in a different part of algebra.

Linda Arntzenius: What did you observe of the Faculty? Can you share any reminiscences you might have of Gödel[26], for example, or Einstein[27]?

Christine Ayoub: Well, Gödel was a very strange person. I never had any personal relationship with Gödel. [He was] very withdrawn. He had just proved his completeness theorem, which I didn't know much about it at that time. But

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[25] In reviewing this transcript Prof. Ayoub added: "I did little research that year but I did work hard learning as much mathematics as I could. In the next years it paid off when we went to Penn State in 1952; the mathematics department had just started a doctoral program—they had just awarded their first Ph.D. Luckily for me they had no one on the faculty whose specialty was algebra. So I had the privilege of teaching the graduate courses in algebra. It was in that way that I got involved in research and directing students' research. I really enjoyed teaching and spent much time on it. Later other algebraists were hired and we had some very good seminars. So the time at the Institute was valuable in the long run. However, I believe I would have profited more from the experience if I had gone a little later [in my career]. Whether that is true for others who came to the Institute right after getting their Ph.D.s I cannot say. I know that Mary Dolciani had an unfortunate experience. She had just received her Ph.D. from Cornell and was working on an unsolved problem in Number Theory. She seemed to be making good progress but toward the end of the year Hua looked over her work and found that she had misinterpreted something and her work came to nothing. Later she wrote textbooks which were quite popular. I spent time talking to a young man from McGill. He too was a little at sea. The Institute is rather a scary place for a young mathematician unless you have some kind of a mentor. And it doesn't help being a woman."

[26] Kurt Gödel (1906-1978), Member in the School of Mathematics, 1933-1935, 1938, 1940-1953; Professor, 1953-1976; Emeritus Professor, 1976-1978.

[27] Albert Einstein (1879-1955), Professor in the Schools of Mathematics and Natural Sciences, 1933-1946; Emeritus Professor, 1946-1955.

I took a course later with Quine[28], who was at Harvard and I learned some logic.

I used to see Einstein all the time. I'll tell you the *non-story* about Einstein. I was in the mailroom. It was my birthday and my mother had sent me a birthday cake and I'd opened it. I looked up and saw Einstein coming up the walk and I didn't have the nerve to ask him to have a piece of my birthday cake. So it was a non-story.

Linda Arntzenius: That's funny. People always talk about Einstein, but the Institute is much more than just Einstein, even though he had a big impact and a big presence. I wonder if you could tell me what your first impressions were of the place. I know you were interviewed – did you get an interview with Aydelotte or Oppenheimer?

Christine Ayoub: No, just with Weyl.

Linda Arntzenius: Isn't that interesting.

Christine Ayoub: I guess if Weyl said it was okay that was enough. Do Members usually get interviewed by the [Director]?

Linda Arntzenius: From what I heard, Oppenheimer was in the habit of interviewing new Members, but he probably hadn't established that habit since he had just come in.

Christine Ayoub: He had just come in. I think he came in September. I met Aydelotte, but I don't know that he interviewed me as such.

Linda Arntzenius: Were there a lot of young people at the Institute at that time?

Christine Ayoub: There were quite a lot of young people, yes.

Linda Arntzenius: This is after the war and the Electronic Computer Project, I think, drew a lot of people to the Institute. Did you observe anything of that?

Christine Ayoub: Not very much, no.

Linda Arntzenius: But you did see a lot of young people there?

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[28] Willard Van Orman Quine (1908-2000), Member in the Schools of Mathematics and Historical Studies, 1956-1957.

Christine Ayoub: Oh, yes. There were a couple of people from McGill whom I knew and I talked to quite a bit. Mary Dolciani[29]. And Olga Taussky[30] was there, but she was quite a bit older than I was. I enjoyed the Institute.

Linda Arntzenius: You came back several years later with your husband[31]; he was also a mathematician, I understand.

Christine Ayoub: He wrote his thesis with Hao. He was writing a book on analytical number theory and he'd had a grant from American Math Society and we'd been at Harvard that year and then we went to Princeton for the summer and we both applied for membership. They wrote back and said they'd make him a Member but as long as I was his wife, I'd have all the privileges and it wasn't necessary to make me a Member.

Linda Arntzenius: How did you feel about that because you had been at the Institute before and he hadn't?

Christine Ayoub: Well, I guess it didn't bother me too much, but I think it shows a certain [degree of gender discrimination]--if it had been the other way, I don't think they would have made me a Member. I mean the logical thing would have been since I'd been a Member before, to make me the Member. *[laughter]*. However, we had a good summer. I had two small children then. I saw a lot of--I didn't see Hassler Whitney himself--but I saw his wife. They had two small children about the ages of mine. So I saw quite a lot of her and the children.

Linda Arntzenius: Yes, I was going to ask whom your children played with.

Christine Ayoub: I don't know if you knew Nathan Fine at all. The Fines lived across the street from us and they had children roughly that age. Later Fine was a professor at Penn State. I knew Atle Selberg[32]. He was a number theorist and my father was a number theorist and he was much impressed by his [Selberg's] work. Selberg had gone out to Montreal for an interview at McGill, but he didn't go to McGill. But when I was at Cornell, I spent a weekend with the Selbergs up at Syracuse and met the people in the department there.

Linda Arntzenius: He had just come to the Institute, I believe. He was quite new.

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[29] Mary P. Dolciani (1923-1995), Member in the School of Mathematics, 1947-1948.

[30] Olga Taussky-Todd (1906-1995), Member in the School of Mathematics, 1948.

[31] Raymond Ayoub (1923-2013), Member in the School of Mathematics, 1960. From July 15 to September 1, 1960 Raymond Ayoub stayed in IAS housing with Prof. Christine Ayoub and their two daughters, aged 4 and 7.

[32] Alte Selberg (1917-2007), Member in the School of Mathematics, 1947-1951; Professor, 1951-1987, Emeritus Professor, 1987-2007.

Christine Ayoub:	He wasn't at the Institute when I was there. He came to the Institute sometime in the '50s. He was still at Syracuse. He wasn't much of a talker and I can remember that his wife was pregnant and wasn't feeling well. She insisted that he take me down to the bus station. I very much wished she hadn't because it was hard making conversation.
	Who else did I know? I knew Michael Atiyah[33]. He was Lebanese, of course. Well, he is Lebanese and so was my husband. We didn't know him at the Institute, but when we spent a sabbatical in Oxford, I remember going out to their house there. It was very modest--it just shows the difference between America and England—the house didn't suggest a professor at Oxford to me.
Linda Arntzenius:	What did you observe of the atmosphere of the Institute at that time? Would you say it was very elitist or egalitarian or?
Christine Ayoub:	I'll tell you another sort of anti-feminine [experience]. The year I was getting my degree, I was approached about becoming the librarian for Princeton's math library. The librarian was about to retire. Bert Yood, who was to get his degree at the same time, was not approached. So I deduced that they thought that a woman would be content to be a librarian. I'm afraid I was rather arrogant and had no interest. In retrospect it might have been an interesting job meeting all sorts of mathematicians. However, I don't regret it because I love to teach. Actually, I still teach; only now I teach bridge!
	When I got to Princeton I spent a lot of time in the math library. I don't know whether it was the old librarian who hadn't retired yet or her replacement but her view was that no book should go out of the library. And I had this room which was some distance away. It was down--I don't know if you know Westcott Road--so it was quite a long way and I didn't like to walk it at night very well. So I liked to take books out of the library. She was rather opposed to that idea.
Linda Arntzenius:	Didn't von Neumann[34] live in that area, I think?
Christine Ayoub:	Did he? He certainly was there.
Linda Arntzenius:	He was quite famous for parties. Did you ever go to any of his parties?
Christine Ayoub:	I didn't get invited to any of his parties.

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[33] Michael Atiyah (1929-), Member in the School of Mathematics, 1955-1956, 1959-1960, 1967-1968, 1975, 1987; Professor, 1969-1972.

[34] John von Neumann (1903-1957), Faculty in the School of Mathematics, 1933-1957.

Christine Ayoub: At the end of that year, I had some interviews; my first interview was at Michigan, University of Michigan. Hildebrandt, who was the chairman, interviewed me, and you know what the first thing he said to me? He said, "Well, for the first-time position, we don't usually have an interview, but since you are a woman . . ." I should have asked him what did he expect, but I didn't. But I crossed Michigan off my list rather fast.

Then I was interviewed by Cornell. I think I was the first woman they'd ever hired in the mathematics department. They had people on a temporary basis. And so being primed by this, I said to the head, who was Agnew, "Will there be any prejudice against women?" "Oh, no, how could I possibly say something like that?" Well, after I'd been there a couple of months, it turned out they had a big fight in the department about hiring a woman.

Linda Arntzenius: But you got your place.

Christie Ayoub: Well, they hired me.

Linda Arntzenius: There's been a lot said about the lack of women on the Faculty at the Institute over its 80 year history. Have you any thoughts or any explanation as to why that is? Obviously, there are those prejudices, but have you any other thoughts on that?

Christine Ayoub: Is it true in all the Schools, or is it just in mathematics?

Linda Arntzenius: Well, there are four Schools. As far as I know, there are no women on the faculty of Mathematics. And I know that there aren't in Natural Sciences. There are women Members, but the only women faculty are in Historical Studies and Social Science. And Social Science is a small school. There are quite a number of women mathematicians who come to the Women and Mathematics Program each year, but have you thoughts about why there are no women on the Faculty?

Christine Ayoub: There aren't women of the stature of the men that are on the faculty. I don't think it's prejudice. And the reason women don't go into mathematics is hard to say. In the M.A. program at Penn State, the women are usually just as good and often superior to the men, but they don't tend to go on to the Ph.D. nearly as often. And I think it's partly because of getting married and having children.

I guess it's better for young women now. Mathematics, as you probably know, is a subject for young people. If you're a historian, you probably can take off ten years. I don't think you can do that in mathematics. You

have to be right on top of it from a very young age and that's the age in which many women are getting married and having children.

Linda Arntzenius: So you think that there are good or understandable biological reasons for this?

Christine Ayoub: In mathematics, yes. I don't think that it explains it in the other subjects, but then I'm not really in a position to judge. At Penn State for many years, I was the only [woman] professor in the College of Science. Now, there are more. There are about 35 full professors of mathematics, of whom about 6 or 7 are women. I can't help but feel there's quite a bit of prejudice. Penn State's a good institution but being a Penn State professor is not like being a professor at the Institute for Advanced Study.

Young women do tend to get ahead in mathematics more easily now. When my children were young, I taught part-time for a while, but with the children, I really didn't do much in the way of research. It's hard to get back in the swing. But do *you* have any feeling why it is?

Linda Arntzenius: Well, partly what you're saying, yes, I do think there's a lot to be said for that, because women are presented with that problem and I think more women are the prime caregivers of children. I think it's changing, though. And I also think that, as one young Member said to me recently, the fact that the Institute offers childcare is a positive thing for young Members and perhaps that's something that institutions need to do more of, if they want to attract more women faculty.

Christine Ayoub: Now, the summer we were there, I don't think they had childcare.

Linda Arntzenius: Well, I'm talking about Crossroads, which probably, I'm not sure existed when you--well, wait. It would have existed when you were here. But it's a preschool during the academic year.

Christine Ayoub: I see. So it wouldn't have been going in the summer, because certainly if they'd had childcare in the summer there, I would have taken part in more things, but the children were quite young. I don't remember having childcare of any kind. I was brought up [with the idea] of the husband being the main breadwinner. I wouldn't have felt comfortable just getting a nanny and going off to work all day. I had some babysitters, but many times my husband's schedule and mine were arranged so that he could teach and then come home so I could go and teach.

But there was no thought that I was going to go and do research, although I went to seminars and lectures. I didn't completely stagnate. I have directed about a dozen doctoral theses. So I have done quite a bit, but not in the very first years.

Linda Arntzenius:	Right, yes, it's understandable. When you came to the Institute the second time, you were here as a Member spouse. What did you observe then? Was your experience very different that time around?
Christine Ayoub:	Yes, it was more or less housing. I did see quite a bit of the Whitneys, but that was on a social basis. Our first priority was for my husband to get ahead; when I say get ahead, get promoted and do research. What I did was secondary, and I think that was pretty typical for my age group.
Linda Arntzenius:	I think so, too, and I think it's not atypical nowadays.
Christine Ayoub:	Women may get ahead better, but the number of divorces is rather high. So it's hard to say what's good and what's bad.
Linda Arntzenius:	When Flexner was setting up the Institute, he and, well, Veblen primarily also, thought that it should be a place apart, not cloistered exactly, but somehow apart. Since then, there have been many other Institutes for Advanced Study created. Do you think that there's still a need for this idea of removing oneself away to do research?
Christine Ayoub:	I don't know that the people at the Institute are that isolated, do you think? It seems to me that they have quite a bit to do in the community. The Canadian Mathematical Congress has a sort of an institute, but it's an entirely different thing. It's just in the summer. In Canada, universities end in April or, at the very latest, the first of May. They have a summer institute which is in May, June, July, August, and maybe part of September. McGill didn't begin until October.
	I don't know whether they still have it at Queen's. They used to have it at Queen's in Kingston, Ontario. They paid the people to come and people would come for four or five months. So that was sort of a mini-institute, you might call it.
Linda Arntzenius:	Did you go to those?
Christine Ayoub:	Yes, I've been to a number of Congress seminars. They take place every two years and last a month. They get eminent mathematicians to give a series of lectures.
Linda Arntzenius:	Do you think that there's still a need for a place like the Institute for Advanced Study now that research is done at universities and there are other options. I'm wondering if Flexner was around now today, would he create the same organization as he did back then?

Christine Ayoub: It's still true that it's more important for the young people who go there. What happens in the universities is by the time you get to be a full professor and have a good reputation, you're allowed to do your research. In the universities, the full professors who already have a reputation get a light teaching load to allow them to spend time on their research. But young people have much heavier teaching loads. I taught 12 hours a week at Cornell and earlier the teaching load for assistant professors was 15 hours a week. So the opportunity to spend a year at the Institute, free of teaching responsibilities, is very valuable.

Maybe it should be the other way around. But that's not the way it works. However, at least from my experience, it's better not to go to the Institute right after the Ph.D. It's better to wait until you are a bit more mature. You feel more self-confident if you have already published a few papers. It's hard when you're 25 to go up and knock on someone's door at the Institute and say, "I'd like to talk to you."

Linda Arntzenius: Oddly enough, the young woman I spoke with yesterday felt that she would like to come back as a more mature scholar.

Do you keep in touch with the Institute through AMIAS, perhaps?

Christine Ayoub: The latest contact I've had was with Linda Cooper. My husband died a year ago and then I was sick for a year or so before that. So I haven't really kept in touch with many things. I don't do any mathematics anymore. The field is so far beyond me now.

Linda Arntzenius: Well, I've heard that said. It's for the young, but we have quite a few mathematical physicists who would probably disagree with you.

Christine Ayoub: I'm not in that field, so I don't know but it's my impression that mathematical physics is somewhat different.

Going back and looking at the landmark theorems, you find that most often they are discovered by young people. In fact, some were worried that they were appointing to the Institute people who'd already done their best work.

Older people can certainly know a lot of mathematics. It's just that they're not coming up with as many original ideas as some of the younger people.

Linda Arntzenius: Do you think the Institute could be just as valuable if there were no permanent Faculty?

Christine Ayoub: I think it would lack stability, wouldn't it? You'd have to have somebody to decide who to give temporary memberships to. I think you need some

permanent Faculty. And then they do give lectures and conduct seminars, even come and drink tea with you. *[Laughter]*

Linda Arntzenius: Oh, yes. Did they have tea in those days?

Christine Ayoub: They had tea in the lounge. They had a cafeteria of sorts, but it was teeny.

Linda Arntzenius: Do you remember that? Can you describe that to me?

Christine Ayoub: It was up on the top floor and very crowded and I don't remember a great deal about it, but I don't think I went there very often because my space was more valuable than my company.

Linda Arntzenius: And I imagine people smoked as well.

Christine Ayoub: Oh, yes, they smoked in those days, but they don't smoke anymore, I guess.

Linda Arntzenius: You often see pictures of Oppenheimer with his cigarette and sometimes a cup of tea.

Christine Ayoub: Did you ever know Oppenheimer?

Linda Arntzenius: No.

Christine Ayoub: He was kind of a sad character. When I was at the Institute, I didn't think too highly of Oppenheimer in that he was very--well, he was aloof. He didn't have much to do with people, but when he lost his clearance and so forth, I thought it was awful.

Linda Arntzenius: Very sad.

I'm coming to the end of my questions, and I wanted to ask you if there was a question that perhaps you expected me to ask that I haven't asked you.

Christine Ayoub: Not that I know of. I don't think so. I don't know as much about the Institute as I should. It was a long, long time and then I didn't really get to know the professors, so I can't tell you an awful lot about them.

Linda Arntzenius: No, but being a Member of the Institute is quite an achievement and you've had a long career as a professor of mathematics, absolutely.

Christine Ayoub: Not that I've done great mathematics--but I kind of found my niche a bit later.

Linda Arntzenius: Yes, indeed.

Christine Ayoub: I did have the advantage of getting my Ph.D. before I got married. So I didn't have that hurdle to go over after I got married. But we wanted to have children pretty fast.

Linda Arntzenius: Now, you said that one of your children is in mathematics?

Christine Ayoub: Yes, actually she went to Cornell. She was in the Vietnam era. She went to Cornell for two years and she took over--helped take over--the cafeteria building there. Then she went to a Communist cell out in Chicago, but she finally came to her senses and went back to college. She was originally interested in biology, but she found mathematics a bit easier, I guess[35].

Linda Arntzenius: Well, thank you. I'm going to turn this off now. And I thank you very much for giving me your time.

Christine Ayoub: That's okay.

[End of Audio]

[Restart Audio]

Linda Arntzenius: You mentioned Raoul Bott[36], who was a Member and a Visitor at the Institute on many occasions.

Christine Ayoub: Yes.

Linda Arntzenius: Was he at the Institute when you were here?

Christine Ayoub: He was at McGill and he was doing engineering. My father used to invite students over to tea and Bott was one of the ones that he invited and they got to be quite friendly. My father was the one who advised Bott to go and do graduate work in mathematics. And then of course, he [Bott] was at Harvard. The year before the summer we were at the Institute we were at Harvard and he was a professor at Harvard at that time. We saw quite a bit of him then. My husband and he had been fellow students at McGill, although my husband was in mathematics and Raoul was in engineering. So he was one person I knew.

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[35] In reviewing this transcript, Prof. Ayoub added that her daughter spent several years teaching in Chicago schools and for the last decade or so has been teaching at a community college where she is now chairman of the mathematics department. Prof. Ayoub's younger daughter is executive director of a retirement community in Morgantown, West Virginia.

[36] Raoul Bott (1923-2005), Member in the School of Mathematics, 1949-1951, 1955-1957, 1971-1972.

Linda Arntzenius: What was your husband's experience of the Institute, was he productive there? Did he value the time there?

Christine Ayoub: He was finishing this book on analytic number theory. It can be used as a textbook but it's not really a textbook, it's more a treatise. So he did a lot of research on that. He had to read all sorts of papers and so forth. It was published by the Math Society and they gave him a grant to write it. And even though it was published in about 1960 it is still the main book of that type in analytic number theory.[37][38]

Linda Arntzenius: You mentioned your husband was Lebanese. Did he grow up in the United States?

Christine Ayoub: No, he grew up in Canada. His parents came over to Canada at the same time and met on the boat. Lebanon at that time it was the Turkish Empire. Ray's father came to avoid the draft. His mother, who was only 16, came to avoid a marriage which her parents had arranged. She borrowed money for the passage from an uncle and came not knowing a word of English. Ray had a difficult childhood because his parents were poor. His mother had 12 children, only four of whom survived to adulthood. His father opened several small stores but they were mostly unsuccessful. It may have been partly because of prejudice against Arabs. One of his professors

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[37] In reviewing the transcript Prof. Ayoub added: "Writing the book I think made Ray quite aware of many unsolved problems and was an impetus to his later research. He directed more than 20 Ph.D. students—the most of anyone in the department. I think I was the second most prolific (if that's the correct word) in directing doctoral dissertations. Together we directed more theses than all the rest of the department put together. In the 1960s, I think it was, Penn State hired Servadamon Chowla, a fine Indian mathematician. He was a charming man; I grew very fond of him and his family. He had received his degree from Cambridge and then spent a year at the Institute. After some time at the University of Colorado, he came to Penn State. At about the same time, Nathan Fine joined the Penn State faculty. So for many years the department had a strong group of number theorists. When Ray was chairman he added to this group George Andrews, who was Rademacher's last student at Penn. Years later George became president of the AMS and was appointed to the National Academy of Sciences. Much of George's work centered around the work of Ramanujan, the famous Indian genius, especially his "lost notebook." "Servy" [Servadamon Chowla] fell in love with the Institute and spent time there whenever he could. He was also in love with mathematics: one time in a conversation about some exciting exploit he turned to me and said quietly, 'we are so lucky because we have all the excitement we need in mathematics.' After his retirement from Penn State he went to live in Princeton to be near the Institute. By that time his wife had died. She was a fine lady; I still have the beautiful sari she left me when she died."

[38] Sarvadaman Chowla (1907-1995), Member in the School of Mathematics, 1948-1949; Visitor, 1950, 1957-1958, 1970-1973, 1980-1981.

asked him what he wanted to do and he said he wanted to be a teacher and this professor said he'd never get a job because he was Syrian[39].[40]

Linda Arntzenius: Thank you again.

[End of Audio]

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[39] In reviewing the transcript, Prof. Ayoub added: "Another person I knew was Deane Montgomery, who was later a professor at the Institute. He was a visiting professor (I believe) at Yale the year I got my degree. Before that he had been at Smith and they asked him to come back and give a lecture. He invited me to ride up with him so that I could see my good friend Grace Bates, who was teaching at Mt. Holyoke. I accepted his offer gladly but was somewhat worried. I was extremely shy and overawed by the prospect of riding with a professor. However, it was a very pleasant trip. He put me completely at ease. Many years later, Deane Montgomery spent a semester at Penn State. I remember going to his lectures and thinking I understood, even though he was a topologist. So many lecturers—especially young ones—are intent on impressing their audience rather than trying to get their audience to understand.

[40] Deane Montgomery (1909-1992), Member in the School of Mathematics, 1934-1935, 1941-1942, 1945-1946, 1948-1951; Professor, 1951-1980; Emeritus Professor, 1980-1992.