



Oral History of Akrevoe Emmanouilides

Interviewed by:
Dag Spicer

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Dag Spicer: Welcome. We're here today. I'm Dag Spicer with the Computer History Museum. I'm here with Akrevoe Emmanou—

Akrevoe Emmanouilides: Emmanouilides.

Spicer: Emmanouilides. And could you just spell that for us so we have it on camera?

Emmanouilides: Of course. My first name is A-k-r-e-v-o-e. My last name is E-m-m-a-n-o-u-i-l-i-d-e-s. And Akrevoe is the Greek word for expensive or precious, and Emmanouilides means the son of Emmanuel.

Spicer: So that's a great name, great combination. Thanks for being with us today. I really appreciate that, and especially, you coming to visit us just kind of on a lark last week. You just came by to say hello and we met, and it turned out that you actually were present at some very important times in computer history. And before we get to those, I thought we'd just start out with your early childhood and where you grew up and maybe a bit about your parents and your schooling. Why don't we just start there?

Emmanouilides: Fine. I was born in Philadelphia in 1928, September 11th, <laugh> coincidentally, which has become a very important day in our own history. I was raised in Philadelphia. My parents were immigrants; my father from the Ionian island of Lefkas, which is on the western coast of Greece, and my mother was from Turkey, from an area called Marmara. She was the youngest of four sisters and a brother, and in 1922 and 1923 when Turkey became nationalized. They came to the United States, settled first in New York, and ultimately, on the upper Hudson, in the Troy area. My father came in, I believe, 1918. He was the youngest of-- I've heard numbers <laugh> like from 18 children down to six, but it may have-- they may have started at 18, but six survived. He left Greece because he-- he didn't want to serve in the wars, in the Balkan wars, came to the United States virtually illiterate. Even in his last years, the only thing he could read were the ticker tapes in the stock market, because he had made a little bit of money and found that that was a good way to invest those funds. I grew up the oldest of three children, not speaking English when I went to school at age six, but apparently, I caught on pretty quickly, because I was skipped from the first grade to the third grade. But I was a very unusual Greek child, because I was born with red hair, and red hair is not a common characteristic of Greek children. And so from the beginning, I always felt that I was an outsider. I had a funny name. I had red hair. I was rather plump, because my mother fed us <laugh> very well. I went through grammar school, middle school and then high school, and went to an all-girls high school in Philadelphia. It was called William Penn High School for Girls. It was made very clear to me that I could not expect to go to college. My mother had some education, but it wasn't a thing that little Greek girls did at the time. You didn't go to college. You just got a job and got married. But I was a passionate reader and I knew that there was a better world out there, so I went through high school, did commercial classes, which was shorthand, typing, bookkeeping, English. I took some art classes and graduated at 16. I was the youngest student in my class. And a month before we were to graduate, the school counselor called me into her office and said, "Akrevoe, what do you plan to do?" "I have to get a job." She said, "Well here. Here's a job that I'd like to send you out on," and it was to the University of Pennsylvania. I lived in north Philadelphia, had never been on the University of Pennsylvania campus, which is in west Philadelphia. So I got on the streetcar and went out there to the Moore School of Electrical Engineering at 200 South 33rd Street, and I walked up the steps and was told to meet Captain Herman H. Goldstine. And I found Captain Goldstine very dapper in his beautifully tailored Ordnance department uniform with gold bars on his shoulder. I don't remember the

interview, but he took a chance on this 16-year-old girl who had never had algebra, <laugh> who didn't know this much about real mathematics.

Spicer: What was the position for?

Emmanouilides: It was for his secretary. He was the liaison officer between the Ordnance Department and the Moore School. And he and his wife, who was a mathematician-- her name was Adele Katz Goldstine, and I noticed that she's in-- her biography is in one of your books-- she was a mathematician, and I think developed a number of the programming [tasks]. And I remember we had a rather small office, and the Goldstine's were behind a partition. My yellow oak desk was in the front, and I had a-- I think it may have been an Underwood typewriter. And they provided me with pens and pencils, a stenographic notebook and a typewriter. And I-- as soon as I graduated, which was mid June, I went to the university and started to work.

Spicer: What was it like being, first of all, the age-- you were very young-- and then secondly, in a very technical and demanding environment that maybe was quite new to you.

Emmanouilides: Well it was absolutely very new. I- I didn't even know that such a world existed. And the Goldstines were very kind to me, and they acted in a way as mentors. I felt very safe in that environment. As I got to meet the engineers, John Davis, Robert Shaw, Chuan Chu, Kite Sharpless-- all of these men are listed in the history of the ENIAC-- I think they looked on this girl/child as someone that-- well I have always told my children-- and I have five-- if you have curiosity and enthusiasm, you can almost go anyplace and do anything. And I think that's what I had then, and I hope I still have it. <laugh>

Spicer: So they kind of protected you.

Emmanouilides: Protected, yes. They were very-- they were really very nice. And because I was so naïve, I asked all kinds of questions; you know, what is binary, what is a differential equation, what's an accumulator, or what's an oscilloscope. <laugh> You didn't learn that on 26th Street in Philadelphia, believe me.

Spicer: But those are actually very deep questions. You must have been very lucky to have these people answering them for you.

Emmanouilides: Oh it was-- I- I tell you, it was a miracle. And I still-- these experiences were absolutely life-changing. How can you go back to limiting yourself after you've been exposed to this world? And-- and then, of course, I met Presper Eckert and John Mauchly, who were there all the time, and John von Neumann came through occasionally.

Spicer: This is on the ENIAC Project.

Emmanouilides: This is the ENIAC, yes.

Spicer: Just run through us a little bit of a typical day for you, including who might drop by. What was it like?

Emmanouilides: I hope I can remember. I've thought about these things over the past few years, and I hope my memories are reasonably accurate. But as I said, I sat there at this desk where the door was open. Students would pass by, other engineers from other parts of the Moore School, and of course, the engineers, themselves, who came to talk with the Goldstines. And my work was typing purchase orders, letters, reports. And when we get to the-- to the ECP [Electronic Computer Project at IAS], we can talk about that, about what has been preserved there with my initials at the bottom.

Spicer: Excellent. So probably some of the most important reports that came out of the ENIAC Project were--

Emmanouilides: I possibly typed them, yes.

Spicer: --possibly typed by you. <laugh>

Emmanouilides: Yes.

Spicer: That's great. Tell us a bit about the transition from ENIAC to the IAS Project.

Emmanouilides: The ENIAC was just about finished, and on February 14, 1946—

<crew talk>

Spicer: You were hired in 194--

Emmanouilides: 1945, '45.

Spicer: '45, at 16.

Emmanouilides: At 16, but-- as I say, I became 17 <laugh> two months later.

Spicer: So you were there for a year.

Emmanouilides: I was there for a year. And then, of course, there are all these wonderful stories about how von Neumann and Goldstine met, and I don't need to repeat those. But then, of course, Professor von Neumann must have been planning to build this second machine, the successor to the ENIAC, in Princeton. And because, I guess, the Goldstine's, by then, after a year had some confidence in me, they invited me to go along with them to Princeton and I had no idea what awaited me there. So on-- in fact, I have a letter that I wrote Doctor von Neumann accepting the position, and I'll send you a copy, if you like. <laugh>

Spicer: I'd love to see that, yeah.

Emmanouilides: And-- but because I was so young and came from this protective immigrant environment, my parents would never think of letting me go and live there. So for a year, I took the train

from the North Philadelphia station to Princeton Junction, and from Princeton Junction took the little shuttle train to Princeton, and a station wagon came to meet me and any other commuters that were going to the Institute. And a dear man, whose name was Mr. Harris, would pick me up in this-- what are those called-- the Woodies, you know, those wonderful station wagons--

Spicer: Oh yes, right.

Emmanouilides: --and drive me to the-- to the Institute. In the beginning, when the first group of engineers and the Goldstines were there, they worked in the basement of the Institute, very interesting circular foundation. And there were little offices there, because the Institute, as I said-- and- and this is also in the histories of the Institute-- the Institute, having been a very esoteric and a very intellectual environment thought what do we want with a machine? They thought it was going to make a lot of noise, and it was going to be dirty, and <laugh> who knows what sort of people would be coming in. But they decided they would have to build a building for us, and for I don't I don't know how long, we worked in the basement, but those original engineers were there; Willis Ware and Jack Rosenberg and a few of the others, Ralph Sutz, Julian Bigelow, all of those gentlemen. But ultimately, they built a building about, I would say, 500 yards. I don't know distances too well, but you- you walked from the Institute across a beautiful field where forget-me-nots and yellow flowers grew. There was a wonderful vine that was so fragrant and you passed it as you went-- walked to the Institute. Ultimately, they built this little building that they called The Electronic Computer Project Building. And Herman and Adele Goldstine had a big corner office. My office was next to theirs, and then there were a series of offices for the engineers, and then behind it was a laboratory where they did the construction. But we were able to go to the Institute for lunch and for tea. They have a wonderful custom at the Institute that still exists where everyone between, perhaps, 3:30 and 5:00 could go to the Common Room, which is -- I believe an English term, and you could go to the Common Room and sit there and have tea. And all of these important people came there. I never saw Professor Einstein there, but you saw a lot of other people, as well. And as I say, then the work started at the ECP building.

Spicer: This first building, the basement that you were mentioning, part of the computer was already there?

Emmanouilides: I don't think so. I think it was primarily theoretical, because I don't think they did any construction there. I think it was just getting things started.

Spicer: Just offices and people thinking about it.

Emmanouilides: Yes, just offices.

Spicer: How long were you at the Institute, and did you get to see the machine operate?

Emmanouilides: I began there in 1946 and stayed until 1949. And you know it was a stupid, young person's mistake to leave there. I should have stayed, but I didn't see the finished computer at all. But I had some unbelievable experiences at the Institute. Virtually every day, we could watch Professor Einstein walk to work. He lived at 112 Mercer Street, and there's a book that the librarian at the Institute gave me that's called "112 Mercer Street." And Professor Einstein very often walked to work with Professor Gödel, Kurt Gödel, and we would-- you could see them coming in past the elm trees and along

the path. And of course, Professor von Neumann, who was-- I- I think von Neumann is certainly one of the most important figures, certainly, in the 20th century. And he always called me Miss Kondopria, and I was his secretary for a short period of time when he was between secretaries, and I wish that I had kept those manuscripts, <laugh> you know, his hand-written notes.

Spicer: Yes.

Emmanouilides: But when you're 17 or 18, I don't think you realize the significance of what you're doing, unfortunately.

Spicer: Right. Well probably they didn't either.

Emmanouilides: Perhaps, but he was always beautifully dressed, always wearing a tie and spoke impeccable English with his elegant Hungarian accent. And of course, his wife was there, also, his wife whose name was Klara, and she became a programmer for the machine.

Spicer: Did you detect any differences between the engineers and the IAS people?

Emmanouilides: I think-- the engineers didn't very often go over to the main building. I don't seem to remember that. Of course, you have to realize what a unique place the Institute was. While I was there, I saw T.S. Eliot, Arnold Toynbee Nils Bohr, Paul Dirac... I mean these people just came through here. And I'll- I'll never forget the day it was announced that T.S. Eliot had been awarded or was to be given a Nobel Prize. And we were up in the cafeteria and Mr. Eliot walked in all dressed elegantly in black, carried his lunch tray and walked over to a table with his colleagues, and simultaneously, all these gentlemen stood up to congratulate him. And these were images I think you can never forget.

Spicer: Wow, that's very dramatic--

Emmanouilides: It is.

Spicer: all these famous people.

Emmanouilides: Yes, and even though you don't-- as I say, you- you may never have a conversation with them, at least you were in that environment. And as I said before, these are earth-changing-- I mean life-changing experiences that- that change you forever, and they certainly changed me.

Spicer: George Stibitz, whom I don't know if you know.

Emmanouilides: I know the name.

Spicer: He was at Bell Labs and he did some early computers.

Emmanouilides: And- and the other person who came through was Vladimir Zworykin who, of course--

Spicer: Oh yes, the television.

Emmanouilides: -- the- the television, exactly. Yeah, RCA Labs was just down the road someplace, and [Vladimir] Zworykin and [Jan] Rajchman came. So these-- thank you, Dag for for reminding me of these things.

Spicer: Well Stibitz once said that in the early days of computing, there were two kinds of people; engineers and girls.

Emmanouilides: <laugh>

Spicer: And that's not what he called them.

Emmanouilides: But there's a-- there's a paper. Have you seen that--

Spicer: No.

Emmanouilides: -- about when computers were women?

Spicer: Oh when computers-- yes--

Emmanouilides: No, I- I know you have the book.

Spicer: --the book.

Emmanouilides: But this one is when computers were women. I have a copy of it. I'll send it.

Spicer: Oh okay, sure. I don't know that one. I have a list of people that I want to go through with you, but you know, mainly IAS people, and if you feel like just giving me your brief impressions on them--

Emmanouilides: Yes.

Spicer: -- and how you related to them or worked with them. So Willis Ware.

Emmanouilides: I don't know when Willis was born. So he was-- as I say, I was, you know, between 17 and 20, and Willis and his wife, whose name is Floy-- a very unusual name-- were very nice to me. Willis took a whole series of photographs at the Varityper and they were-- they were just very dear and very nice people.

Spicer: Did you interact with them later?

Emmanouilides: Oh when I left Princeton, I knew that Willis had gone to Rand in Santa Monica, and I don't know that I tried to get in touch with him. I did get in touch with-- is- is Jack Rosenberg on your list?

Spicer: Yes, yes.

Emmanouilides: I did get in touch with Jack, because <laugh> ... Jack and Francis had, I think, just gotten married in those years. And for some reason-- they were avid skiers. They invited me to go with them to Mont Sant Blanc in Quebec. And I am not an athletic person, but I went with them and tried to ski the first day, and I was so terrified and realized my incapacibilities that I caught a psychosomatic cold and never went on the snow again.

Spicer: To this day?

Emmanouilides: To this day. <laugh> But when we went to Los Angeles in 1961, when my husband got a position at-- a traineeship at UCLA, I knew that the Rosenbergs were there and I called them and went to visit them with our--three children at the time. But then-- our lives went one direction. Their lives went another. And I didn't keep in touch with them until just two years ago when I was going back to the Institute and I was asked by the librarian if I would participate in an oral history interview. I wrote Jack a letter, asking if he had any Institute materials that I might use. And he telephoned me right away and I went and visited him and we reconnected.

Spicer: Terrific. Isn't he the one who built a stereo for Albert Einstein?

Emmanouilides: For Albert Einstein, yes.

Spicer: Why don't you tell us that story?

Emmanouilides: In fact, Jack has written this, and I'll be glad to send you a copy of that, if you're interested in it.

Spicer: Please, sure.

Emmanouilides: Jack and Francis Rosenberg were-- were passionate music lovers, and Jack built hi-fi sets for himself, and I suppose, for friends. And Professor Edgar Panofsky-- is his name_____ Panofsky--

Spicer: Edwin.

Emmanouilides: Edwin- Edwin Panofsky heard about this skill.

Spicer: Or Erwin, Erwin.

Emmanouilides: Erwin Panofsky, yes, yes, Erwin Panofsky, who was in the School of- of Humanities at the Institute, who had a-- who walked through the-- this is wonderful, all this <laugh>.

Spicer: Good, I'm glad.

Emmanouilides: He would take a walk everyday and he had a beautiful red setter dog whose hair was about the color of mine, <laugh> bright red hair. Professor Panofsky heard about Jack's interest and came to him, and because his colleagues and friends wanted to do something very special for Professor Einstein's 75th birthday, asked him if he would build a hi-fi set, because Einstein was a violinist and and loved music. Of course, Jack couldn't possibly refuse, so he did build this. And in his memoir, he talks about having built it and then taking it to 112 Mercer Street to deliver it. And I think he says Miss Dukas, Einstein's secretary was going to smuggle it in to an upstairs room, but I-- if I remember correctly, I think Einstein answered the door <laugh> and here was this presentation. But from what Jack says in his writings, Professor Einstein was so touched by this, and that this young man would do it that they became friends. And Einstein visited the Rosenberg's at their apartment and they became friends. So these are the-- there- there are a lot of Einstein stories. Everybody in Princeton seems to have-- I have an Einstein story too, but- but--

Spicer: Oh well let's hear it. I'd love to hear it.

Emmanouilides: <laugh> It- it's--

Spicer: Well thanks for telling us, first of all, about--

Emmanouilides: Yes, Doctor-- Fran-- Jack, yes.

Spicer: -- Rosenberg. But if you have an Einstein story, I'd love to hear that.

Emmanouilides: Just the-- well one day, I was running to get a check cashed for Professor von Neumann, and I had to go down the hall to the other end where the treasurer's office was. Of course, I was eager to get this done and ran right into Professor Einstein, who smiled at me and said, "Good morning." That was one. But secondly, the- the director of the Institute, in the beginning years was a man named Frank Aydelotte. He- he had been president of Swarthmore University.

Spicer: He was a Quaker, I believe.

Emmanouilides: A Quaker, absolutely, and very charming, a rosy-cheeked gentleman who had a very unique-- and I don't know whether it was an idiosyncrasy, or perhaps he had been injured-- but he always-- when you went to shake his hand, he reached out with his left hand and shook your hand this way. It was very interesting. But he and his wife lived in the-- in the Institute director's home, which was a beautiful Revolutionary era home at the top of the hill facing the Institute. Before Christmas one day, all the secretaries got an invitation to go to the director's house for tea, and Mr. Harris came and drove us up. And this beautiful-- I'd never been in a Revolutionary mansion-- I lived in a row house in Philadelphia <laugh> and had never been in a gorgeous period home like this. And what's interesting is I still remember some of the names of those secretaries.

Spicer: And so were these also working on the project?

Emmanouilides: No, these were women who were working in various departments. One, Gwen Blake was Professor Einstein's secretary, and she was a very unusual women, because she had a condition called <laugh> the DiGeorge Syndrome, where you have one blue eye and one brown eye, and she was

a white-haired lady and protected Professor Einstein at the Institute. And then there were a whole series of other women. So we went to Dr. Aydelotte's house and were eating fruitcake and drinking eggnog and cider and tea, and someone knocked on the door and here came Professor Einstein with Miss Dukas, his secretary. And that had been, I would think, you know, a beautiful gesture on Doctor Aydelotte's part to honor us in that way.

Spicer: Yes.

Emmanouilides: And Professor Einstein sat in a beautiful wingback chair by the fireplace. He was wearing, you know, a wool sweater. And here was this image, this-- probably one of the most recognizable faces in the world. Would you agree?

Spicer: Oh yes, without question, even today.

Emmanouilides: I mean anyplace, even today.

Spicer: Yes.

Emmanouilides: And there he was.

Spicer: Wow.

Emmanouilides: You know I don't-- probably don't remember a thing he said.

Spicer: Pretty impressive when you're--

Emmanouilides: No, but just just being on the-- just being on the edges of something like that. And my guess is the- the other women, who were older than I was and more sophisticated, I'm assuming that they asked him about his music, that they asked him questions, and he was certainly receptive. I remember that image. And then he stayed for an hour or so and then left. And then I have another semi-Einstein story <laugh> I used to commute. But then Solomon Bochner, who was a very famous mathematician at the Institute and at Princeton, was going to Harvard for a sabbatical. And he, his wife and daughter, whose name was Deborah, lived two blocks from the Institute. And he came to Dr.-- to by then, Dr. Goldstine-- he was no longer a major, Doctor Goldstine-- and asked if I would like to live with them while he was away, so that his wife would have company. And my parents agreed to that, because then I didn't have to commute, and I would be living with a very responsible family. So I got to live in this beautiful, contemporary-- you know at that time, this was '47, '48-- modern house. I had my own bedroom, which I didn't have at home, my own bathroom, and all I had to do for Mrs. Bochner-- whose name was Naomi, Naomi Bochner and her daughter, Deborah-- was to squeeze orange juice in the morning, because she had a maid, and- and just be there for her, for-- just be a guest, in a sense.

Spicer: So not too bad. <laugh>

Emmanouilides: Not too bad. And Mrs. Bochner, who was a Smith graduate-- yeah, I think she was from Smith and had had-- I think her degree was in art history, -- she and I would sit in her library. And

here was this-- you know, this decent looking red-haired girl and she would say to me, "Akrevoe, you look like a Renoir painting, and you should wear blue and you should wear green." And she taught me to listen to chamber music. She taught me about the Impressionists. She taught me about things that I never would have learned by myself. So that was another episode that obviously changed me.

Spicer: Right.

Emmanouilides: She also-- Rutgers was only 19 miles away and she said, "You know there's a bus from Princeton, and you can take it and go to Rutgers and take a night class," and that's what I did. And through the snow and the rain, <laugh> I would get on this little bus after work. And I took one class. I took an English class. By then, the- the ties with my family had lessened a bit, because I had been living away from home, and then I lived by myself in a series of rentals. Then I met a young woman at the Institute, whose name was Judy Braude. Judy was Oscar Morgenstern's assistant. She was a graduate student from Swarthmore, and somehow got a job there. She was an economics major and was helping Professor Morgenstern with The Theory of Games and Economic Behavior. And so we lived together in just over a garage down at 345 Nassau Street, and at Princeton, Judy met a young graduate student whose name was John Kemeny. John was a graduate student and was Einstein's assistant. We would invite John and cook spaghetti, and he liked to come to our house. We were friends and he would take me to the movies. I think he really would have loved to be closer to Judy, because she was, you know, bright and educated, but Judy met a young man, who was also a graduate student in economics. His name was Fred Balderston, and Fred Balderston's father was the dean of the Wharton School <laugh> of the University of Pennsylvania. And they fell in love and they got married. Judy was from a Jewish family and Fred was from a Quaker family. And it wasn't the Quakers who worried about it, it was the Jews, because they were afraid that perhaps, you know, Judy would not be accepted. But she was accepted wholeheartedly and they had a beautiful wedding out in the country in Putnam Valley, New York. They had four children. And Fred became a professor at Berkeley, and I think he had a very high position at Berkeley for a number of years. Judy died of cancer a number of years ago, and Fred remarried and is still very happy.

Spicer: Wonderful. We have to just take a break to change the tapes.

Emmanouilides: Sure.

Spicer: And we'll stop there.

END OF TAPE 1

Spicer: Okay, we're back to tape two. So we were just chatting a bit about John Kemeny at the end of the last tape. He was Albert Einstein's personal assistant for at least a year, maybe two years.

Emmanouilides: Yes.

Spicer: And who is also a friend of yours.

Emmanouilides: Yes, he was. As I say it was because of Judy Braude. One time John invited me to go to a football game with him, and then to one of these dining hall parties. My mother made me a pretty pink

dress and I realize that all the other girls must have been from the fancy schools and universities, but he was lovely and kind to invite me. And then of course he went on-- he's in your museum. There's a photograph of him here in your museum. What was it BASIC that he-

Spicer: Yes, at Dartmouth.

Emmanouilides: At Dartmouth, he became the President of Dartmouth. Even then, he smoked a lot, and unfortunately died much too young. I think probably in his 50s. It was really tragic.

Spicer: Let's go back a little bit with ENIAC because we didn't really describe what it was like. And you're in actually at least one, maybe two famous pictures of ENIAC. Did you get to see it running for starters, and if so what was it like? Was it noisy? Was it hot?

Emmanouilides: I wish that I could remember more clearly, but I certainly could remember going down into the basement where the machine was built. And here was this enormous room with 18,000 vacuum tubes and all of those things. I'm going to start a memoir, and I'm going to say "I'm going to buy my own computer in 2008, but I saw my first computer in 1945." But I think that's a good opening, and you can go from there.

Spicer: So you've seen them go from the size of a room...

Emmanouilides: Two.

Spicer: To something that goes in your pocket.

Emmanouilides: Absolutely. And it's not that I have seen it, but I've certainly been aware that these things have happened. And just that sense of having been on the ground floor of something like that. I often wonder if those creative young men who were there, if they themselves realized what this revolution was going to do. Do you have interviews of any of these people?

Spicer: We have some. My sense is I agree with you is nobody, no matter how smart they were or how hard they worked could possibly have told where computers would go even ten years later.

Emmanouilides: I have a feeling, I really sense that they knew, on both machines, that they knew that they were doing something important and something that had never been done before. And understanding that, of course, gives you certainly a feeling of pride and of as I say this feeling of just being on the ground floor where no one had ever stepped before. And I guess maybe I hoped that I had that in my own innocent naïve way. I think I did, because how could you-- how could all these people come through there? How were they paying attention to what was being done there if it wasn't important? I remember Nils Bohr coming through. The other people who came through were Nicholas Metropolis and Stan Frankel who were working on the Los Alamos project.

Spicer: Right.

Emmanouilides: You know those names as well.

Spicer: Oh yes.

Emmanouilides: And they stayed at the Institute for a long time. And of course Nick was a Greek.

Spicer: This is the Institute, not ENIAC.

Emmanouilides: Oh, I'm sorry. We've distracted but, no but they were at the Institute. But certainly at the ENIAC you had to realize that something world-shattering was happening.

Spicer: Did you actually see it running?

Emmanouilides: I think I must have. I think I must have. Certainly when they dedicated the machine and there are those shots of me down there. I wish-- frankly I don't remember having those photographs taken, but I'm there.

Spicer: That's amazing. You mentioned earlier that you danced with Robert Oppenheimer?

Emmanouilides: Yes.

Spicer: Tell us a bit about that.

Emmanouilides: In fact I still have the invitation. It was for cocktails and dinner at the Von Neumann's. A little hand-written card that Mrs. Von Neumann wrote. It was her handwriting. I don't remember the date. I think it must have been 1948, and they invited the computer people, and certainly people from the Institute. And I believe Professor Oppenheimer had now become the Director of the Institute. Dr. Aydelotte I guess resigned or retired, and then J. Robert Oppenheimer became the Director, and of course this was very significant. It's in all his biographies and in all the-- there are a whole series of books, Von Neumann and Oppenheimer. Just endless. Oppenheimer and Einstein, there's a new book that's just been put out. And I remember wearing-- I had a pretty black dress. It was such a pretty black off-the-shoulder dress. And for some reason Dr. Oppenheimer asked me to dance, and I wish I could remember what he said, but I do remember dancing with him.

Spicer: Wow, father of the atomic bomb.

Emmanouilides: Yes.

Spicer: That's pretty good. Let's go through some of the other names that are associated with IAS and ECP which you mentioned before stands for?

Emmanouilides: ECP, or the Electronic Computer Project. That's what it was called until I suppose until the machine was completed, and then it had-- I believe a series: A Maniac, a Johnniac. Aren't there a number of-

Spicer: Right, 17 machines that copied the IAS design.

Emmanouilides: Oh is that right?

Spicer: And they were given names like Johnniac and Weizac and Maniac.

Emmanouilides: But was the first one the Johnniac or the Maniac?

Spicer: The first one was the one at IAS.

Emmanouilides: Yes.

Spicer: I'm not quite sure how they fell after that. There were within the next couple of years about 17 copies of the Institute's machine got made.

Emmanouilides: And they were put to use?

Spicer: Oh very much so, yes. Mainly in military, for military-

Emmanouilides: Applications.

Spicer: So we've done Willis Ware. How about Julian Bigelow [ph?]?

Emmanouilides: Yes, Julian Bigelow. Yes, Julian Bigelow had the corner office as you came into the ECP building, and he was a very handsome gentleman. His wife's name was Mary, I remember. You have to realize, I was the only typist there at the Institute, I mean at the ECP. I was the only secretary.

Spicer: You were busy.

Emmanouilides: So in a sense, everything had to go through this kid. And of course I just had a typewriter and ultimately they bought a machine called a Varityper, and the Varityper was a big bulky instrument, and Willis Ware took a photograph of me that I will send you sitting at the Varityper. And on that Varityper I typed "Planning and coding of an electronic computing instrument" which is apparently almost priceless these days. I don't think we ran off more than 50 or very few copies. And it was Von Neumann, Goldstine and possibly Arthur Burks. Do you have a copy of it?

Spicer: I'm not sure that we do.

Emmanouilides: Do you know who Jeremy Norman is?

Spicer: Yes.

Emmanouilides: Okay, in his, you know he has this catalogue and he has a copy of it that I think it was \$20,000 or \$30,000 that he was hoping to get for it. And I wonder, that's why I was hoping that perhaps Jack had a copy of it but he couldn't remember. But I typed that and so you had to- I didn't know what I

was typing, but I knew the Greek alphabet so I could read sigma and all the other things, and you had to twist these semi-circular discs to go from English to mathematics to Greek terminology, and I just hope someone proof read it, but it was so tedious and...

Spicer: Slow.

Emmanouilides: Slow, but it was-- in addition I did all the letters. In fact when I went back to the Institute for a visit, that was a preceding visit from the last one, the librarian said to me "You must come over and see this exhibit." So I went into the library and there was an exhibit: "The Institute for Advanced Study Electronic Computer Project: 50 Years." And in these glass cases were letters that I had typed with my initials at the bottom.

Spicer: That's great they're preserved.

Emmanouilides: They're preserved, yes. And there are lots.

Spicer: This is on right now?

Emmanouilides: No, I think they closed it now, but obviously all those documents have been preserved.

Spicer: In their archives.

Emmanouilides: In their archives, and that's why you should go back there. Get the museum to send you there--

Spicer: Maybe some copies.

Emmanouilides: Oh that's right. You have to go to Philadelphia.

Spicer: Julian Bigelow, anything else you want to say about him? He was the Chief-

Emmanouilides: In fact when I went back to Princeton, sometimes I think you should act on intuition. It was tea time so I went to the common room and I had tea with I think the librarian. And apparently Julian Bigelow was still living, and I said "Oh, he won't remember me," and so I didn't ask to see him. And the next year he died. So I have learned you must act on intuition.

Spicer: The Goldstines, you kind of talked about a little already but anything else you'd like to add?

Emmanouilides: Sure. One Christmas they gave me a copy of *Madame Bovary* that I still have.

Spicer: Interesting choice.

Emmanouilides: Yes, it is an interesting choice, and I still have it. And then a number of years later I wrote to-- oh, my husband brought home a copy of *Science*. He's from the AAAS. And I don't often go to-- but I happened to open a copy, and it said that Herman Goldstine was being made a member of the National Academy of Science. Why do these things happen? You tell me? So I wrote to Herman Goldstine, and I thanked him for all that he had done for me, and hoped that he remembered. And I got a letter back. At that time he was at IBM and I got this lovely letter that told me about his children and, you know, a very nice reply. And I preserved that letter. I have that in my own archives. And then I read in *Newsweek* that the Moore School was celebrating the ENIAC's 50th anniversary and I called the Moore School and identified myself and asked if I could come. And they said of course you could come. I got an invitation, and because I have a son in Philadelphia, that was a very easy way to do it. So I went. The government, the postal service, had issued a stamp in honor of the Information Age, and they had a reception, and I had an invitation to that. And there I went and saw Herman Goldstine after 50 years. And of course he remembered me. It was just lovely. And I met his new wife, well, she wasn't new then. I mean they'd been married a number of years. Adele apparently died in 1964 of cancer, and the Goldstines had two children. And Ellen Watson-Goldstine raised these children. Ellen Watson, I think was Thomas Watson's secretary at IBM.

Spicer: Was there a family relation?

Emmanouilides: No, it was just a coincidence. And I have now visited her after Herman died, I have visited her in Bryn Mawr where they lived and have become friends with her. I saw Herman and Ellen there and then went to this banquet where there must have been 1,000 people. Do you by any chance-- I can send you a copy of the program.

Spicer: Really? I'd love that.

Emmanouilides: Yes, see these are things that maybe you don't have here but that might be of interest to you.

Spicer: Yes, very much so.

Emmanouilides: And I went to this banquet and the President of the University of Pennsylvania was there, the Mayor of Philadelphia. There were lots of people from the computer world, and there on this enormous screen is this history of the ENIAC. There is Akrevoe in her little black sweater, unexpectedly.

Spicer: We've got to get that picture. We probably have it here actually. We just need to get you to identify it.

Emmanouilides: I have it too.

Spicer: A few more names here. Bill Gunning.

Emmanouilides: Bill?

Spicer: Gunning. Does that mean-

Emmanouilides: No, I don't know.

Spicer: He's one of the engineers.

Emmanouilides: I think he may have come afterwards.

Spicer: How about Pres Eckert?

Emmanouilides: Pres Eckert I remember certainly at the ENIAC. He and John Mauchly would come in and discuss things. I remember a very energetic man, and I think you have an interview with him. Very energetic. Very, I guess we'd call them hyper today.

Spicer: Driven?

Emmanouilides: Driven, yes, I would think so, driven. And his wife I think worked on the ENIAC. She was one of the programmers.

Spicer: Did you interact much with him?

Emmanouilides: I don't think so.

Spicer: Or Mauchly?

Emmanouilides: I don't- I think only if they needed a letter or something like that. The things that secretaries do.

Spicer: Arthur Burks [ph?]?

Emmanouilides: Yes Arthur Burks I remember. He was a very sweet, gentle man. And then I think he went on to the University of Michigan did he? He went on afterwards.

Spicer: That's right.

Emmanouilides: No, I remember Dr. Burks quite well. And then there were a series of engineers that I don't know. Do you have a picture of the ENIAC engineers?

Spicer: ENIAC engineers?

Emmanouilides: ENIAC engineers.

Spicer: I do actually. I think so.

Emmanouilides: Yeah, because I'd be-- Bob Shaw, Jack Davis, Kite Sharpless, you know, they're standing there.

Spicer: Super bright guys. Jim Pomerene I think?

Emmanouilides: Jim Pomerene was at Princeton.

Spicer: Right, you're right.

Emmanouilides: In fact I'd love to know if he's still living. Could we look him up someplace?

Spicer: Sure.

Emmanouilides: But Robert Shaw was a very interesting fellow. He's the gentleman who is standing there in the front. He suffered from albinism. He had pink eyes and white hair, but he was brilliant, just brilliant.

Spicer: Right, I've heard that.

Emmanouilides: And for some reason he was especially kind to me. I remember once he sent me roses. Just dear things like that. I don't know what happened to Bob Shaw.

Spicer: I've heard some amazing stories of him committing giant diagrams to memory.

Emmanouilides: Really. I think he must have been a genius.

Spicer: He had very poor eyesight.

Emmanouilides: Yes, yes.

Spicer: And he'd hold things right up to his face.

Emmanouilides: Exactly.

Spicer: And the only way he could really see an entire circuit at once was to memorize it, because he couldn't visually see it, so he'd have to sort of hold the paper up and commit it to memory.

Emmanouilides: You've reminded me of that. That's right. That was how he saw things.

Spicer: Pretty interesting fellow.

Emmanouilides: I'd love to know-- I wish, I hope someplace we have biographies of these people so that we can see how long they lived, what happened to them.

Spicer: I'll try to help you with that.

Emmanouilides: Yes, thank you.

Spicer: Nick Metropolis, you've mentioned already.

Emmanouilides: Yes, and Nick-

Spicer: Another fellow Greek.

Emmanouilides: You know, I don't think he-- he was from Chicago originally, and I think he probably worked with Fermi and that group. And there was another man whose name was Robert Richtmeyer who I think also came from Los Alamos, and he stayed with us for a short period of time. But Nick would give me letters that were addressed to Post Office Box 1663 Santa Fe, New Mexico. That was the only address you would have, and then letters would come back, and obviously that was Los Alamos.

Spicer: Right. Now speaking of that and the Manhattan Project and afterwards, the Atomic Energy Commission work that Von Neumann was-- Did you have a sense of the kind of work that the IAS machine was doing?

Emmanouilides: I don't think so. I don't think so. I think, obviously since these people were there and things were obviously-- and I'm sure, I think the FBI cleared me. I remember having been cleared a number of times. Because some of the things I did were secret and maybe even top secret. And I remember an FBI man coming and interviewing me. I haven't thought of these things for 60 years.

Spicer: I'm glad we can help. Yeah, because Von Neumann probably got his cancer from his work at the Atomic Energy Commission. They think he was exposed to something.

Emmanouilides: Yes.

Spicer: People weren't as careful then as they are now.

Emmanouilides: Yes.

Spicer: Radiation, but so that's interesting. Hew Crane. Does that mean anything to you? He's an engineer might have come after you left.

Emmanouilides: No, I don't know that name.

Spicer: Louella Trinterro [ph?]?

Emmanouilides: No. I think those are after. The only ones as I say the ones I remember were Ralph Slutz. Do you have him, Ralph?

Spicer: Yeah, I do have him. Tell us. He went to NBS after.

Emmanouilides: Did he?

Spicer: Tell us what he did.

Emmanouilides: Yeah, he was as I say he was one of the engineers that would bring me materials to type information. Whatever I was-- I did work hard.

Spicer: Yeah, I was going to say it sounds like okay, you're the only secretary there and you've got at least five, ten?

Emmanouilides: Yeah, five or six engineers.

Spicer: Or more people dumping work on you all the time. Did you have a lot of late nights?

Emmanouilides: My goodness. I think about what 17 year olds are like today, girls 17 to 20. Maybe we were different then.

Spicer: Yeah, I think that was-- probably worked harder.

Emmanouilides: Or maybe took things more seriously.

Spicer: And being a child of immigrants probably made you take the world not so much for granted.

Emmanouilides: Seriously, yes, I think you did. So Ralph, Jack. Oh, there was a fellow named Morris Rubinoff [ph?]. Have you got him there? I think he came, maybe one of the later engineers. And then of course there were the meteorologists. You know that group.

Spicer: Tell me about them.

Emmanouilides: They were going to use the computer for weather prediction, and there were a group of meteorologists that came. A man named Jule Charney whose son went on to become the editor of the *Saturday Review* of literature. Did you know that Nicholas was a little boy then. A fellow named Gilbert Hunt. Hans Panofsky, Professor Panofsky's son was a meteorologist, and they were-- and a tall, handsome officer whose name was Philip Duncan Thompson, and he came from a very- you got the impression that he came from a very upper class family in Putnam Valley, New York. He was always slickly tailored, and kind of looked down his nose at people, but he was one of the meteorologists as well. And then Rossby, Carl Rossby came and worked with them as well, because they were wanting to use machine for weather prediction.

Spicer: These weren't people from the IAS, were they? They were outsiders?

Emmanouilides: I think they were outsiders. No, they weren't. Yes, they came from I think, oh Scripps Oceanographic, and Woods Hole. I can't believe that I can remember all this.

Spicer: I'm impressed.

Emmanouilides: Okay, let's go.

Spicer: You left the IAS.

Emmanouilides: I left the ENIAC. Oh, yes, I left the Institute.

Spicer: And then what happened after that?

Emmanouilides: Well, I went to Philadelphia. For some reason I thought I should go back to Philadelphia. I went back to Philadelphia, and first I went to Penn because they knew me, but they gave me a job in the Education Department which was boring, so I answered an ad in the newspaper, and I worked at a place called Neighborhood Center which was a Jewish settlement house down in South Philadelphia. And I worked-- I was Secretary to the Executive Director there whose name was Julian Greifer, and that was very interesting because I learned about Jewish immigrant life as well.

Oh, if you really want to get personal, then I met-- and you can cut this out. Then I went to an Easter party, a Greek Easter party that my family had been invited to, and I met a fellow there who swept me off my feet, and in 10 days I eloped with him and went to New York. Left my poor family behind, and shamed them, obviously. Went to New York and had to get a job, so I did the usual thing. I went to the first university I could find which was NYU and I got a job as secretary to the Department of Philosophy, and I became Sidney Hook's secretary. Sidney Hook was the Chairman of the Department of Philosophy, and had been a student of John Dewey's and was a kind, dear man. And he is also one of the intellectuals of the 20th century, written dozens of books: *The Hero in History*, *Out of Step*. I mean just look him up. And I worked for him for a year and then got pregnant and had a little boy, and then because of some problems that my husband had we moved to Washington. When my little boy was 4 years old, his father went to work one day and didn't come back, and left me with I can't remember whether it was \$5 or \$25, but he didn't leave me with much money, but he left me with a lot of debt. So I took my little boy and went back to my family, my parents, and got a series of jobs, ultimately ended up at the Franklin Institute Museum as Secretary to the Director there. Then on a bus, on a Greyhound bus, I was coming back from a visit to my sister, left my little boy with my mother, and there was a young man sitting on the bus reading a Greek newspaper, and I spoke to him in Greek, and sat down next to him for the ride from New York to Philadelphia. He was a Resident in pediatrics at Hahnemann [University] Hospital and I told him about my family, my little boy. You know, I wasn't going to see him ever again. I could tell him my story, and then I said-- he had just been in this country a year and a half. He had done his internship and was at Hahnemann now. And I said "Maybe you'd like to come. My mother would like to cook you a Greek dinner." "Oh, that would be very nice." So he called me up and two and a half years later we were married. He adopted my child, and we have subsequently had four other children.

Spicer: Oh that's wonderful.

Emmanouilides: And he became probably one of the leading pediatric cardiologists in this country. He's written text books. His name is George C. Emmanouilides, and he has done very important research. He was the first person in this country to use the umbilical artery on newborn infants to study their hearts, because you know, babies have stumps when they're born. You know, they cut off the umbilical cord, and it's still viable. And he put a catheter in it and was able to do diagnoses. You could look him up too.

Spicer: Okay, so you--

Emmanouilides: As I say we were in Philadelphia. He had some more fellowships, and then he got a traineeship, a public health traineeship at UCLA and we brought our three children. Came to UCLA because we said it's a great way to see California. We came to Los Angeles with our little ones, and after he got a masters degree in physiology, he was invited to join the faculty and has been on the faculty since then. And then we had two subsequent children, so we now have a total of five.

Spicer: That's wonderful. Obviously you were busy raising this family?

Emmanouilides: Oh and then when I met him, backtrack, when I met him I was as I say I was at the Franklin Institute, and I looked in the newspaper, and there's an ad for a secretary for the director of a children's hospital, so I apply for that job and I got that job to the Chairman of Departments of Pediatrics at Temple [University], and so while George was in his residency, in a sense I had a residency because I learned medical terminology. I learned what it meant to be a physician's wife. I learned about the textbooks and things, and the man I worked for was the editor of *The Textbook of Pediatrics*. He was the editor of *The Journal of Pediatrics* and probably one of the most significant pediatricians in the United States.

Spicer: Wow, what's his name?

Emmanouilides: Waldo Emerson Nelson. He lived to be almost 100 years old.

Spicer: That's a lot of babies he delivered.

Emmanouilides: A lot of-- no he didn't deliver them. He was a pediatrician.

Spicer: I see. So obviously raising family was a full time job. Did you go back to computers at any point in your life?

Emmanouilides: No. What I did was after my youngest daughter, Sophia-- because all along in the background I told you I was a frustrated student, and I felt very inadequate. Here I was in these intellectual--

Spicer: Anybody would feel inadequate.

Emmanouilides: But I felt even more so. I felt, even though I was you know, autodidact I read a lot but I always felt very inadequate as far as my education so my little daughter got to Kindergarten and there was a community college in our area, and soon as Sophia got to Kindergarten I went and enrolled in one

class. It was History of Western Civilization. Wonderful, great beginning for a class. And we had lots of assignments and everything I wrote got an A. And then I thought I'll take an English class so I took a beginning English class and the first thing I wrote the teacher sent me a note saying something about "I've sent this note to someone I know," and in the note, I still have it. It says "This is the most accomplished writer I have run across at Harbor College, and you might want to publish her work." And what I did was I wrote an article about a woman my age, and women going back to school. Sent it to my little local newspaper. They published it with my byline, photographs, and if you don't think that does something for your ego.

Spicer: Oh yeah, that's good. Nice pat on the back.

Emmanouilides: Great pat on the back. And then I continued to write some things that got published locally. I submitted some things to Greek American newspapers that all got published. And then I stopped writing, but I think I'm going to start again.

Spicer: I hope you will especially about this period in your life is really interesting. When you were 16 and anyone of any age would have been so lucky to be there.

Emmanouilides: Yes.

Spicer: And you were there at such an early age it's a double privilege, really.

Emmanouilides: It is and you have to wonder what is it that those people, why did they have confidence in a 16 year old or a 17 year old? Why? And that's a question that I ponder sometimes.

Spicer: Good things happen to people.

Emmanouilides: And good things continue to happen to me.

Spicer: We all deserve some luck in our lives.

Emmanouilides: Good things continue to happen to me all the time.

Spicer: Yeah, and you've got a nice family too. Is there anything else you want to tell us? You brought some papers with you?

Emmanouilides: I didn't. I just made some notes with the people that I remember, and let me see.

Spicer: How about for kids, especially girls.

Emmanouilides: My children?

Spicer: No, I'm just thinking, any words of inspiration you would give youngsters these days about-

Emmanouilides: Actually this is one of the things that I have been working on for a number of years. A number of years ago maybe five years ago, I had a terrible accident. I was thrown out of a car and I was out of commission for a number of months. And while I was lying in my hospital bed I thought about this "only a secretary" idea and I started to write and think about it and write about it. And then I thought about certainly there are still plenty of young women who come from immigrant families who won't become engineers, who won't become scientists, who won't become fashion designers. And I thought I could maybe use my experience to say you can be significant. You can be worthwhile, and you can be important to somebody with the skills you have. Obviously my skills today nobody even uses a typewriter, but you are needed. That's what I want young women to know, that you can be needed in these high-powered environments. They needed me. Maybe I didn't believe it at the time, but they did need me and my little mark is someplace. And if you can inspire a young girl from a Hispanic background or African American girl or a Nicaraguan or a Guatemalan don't be ashamed to be the secretary. Don't be ashamed to say "Oh, I'm only the secretary." Damn it, I was the secretary and I was very good. And here I am.

Spicer: That's a great place to leave it, I think. Thanks so much. I really appreciate you coming in.

Emmanouilides: I hope I wasn't babbling on too much.

Spicer: That was wonderful. Thank you.

Emmanouilides: Thank you.

END OF INTERVIEW