



Computer Oral History Collection, 1969-1973, 1977

Interviewee: John V. Atanasoff (1903-1995)

Interviewer: Uta C. Merzbach

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MERZBACH:

Well, let's check this out.

ATANASOFF:

Will you have a girl transcribe this stuff?

MERZBACH:

Oh yes, and we'll send you a copy so that you can give us your comments on what you want left in, taken out, corrected, and so on.

ATANASOFF:

Right.

MERZBACH:

Well, let's see. I gather you were the oldest of ten children, right?

ATANASOFF:

The oldest of ten children.

MERZBACH:

Right. And your father was an electrical engineer?

ATANASOFF:

Yes. He really wasn't trained in electrical engineering, he was really trained in a more or less liberal sense. At one stage he was going to be a preacher. He was first baptized in the Greek Catholic Church as a boy in Bulgaria. Greek Catholic -- Orthodox Catholic, you know. And then, for some reason, after he got to the United States, he became beset with the idea of becoming a Baptist preacher. And so this liberal learning colored his secondary school education and his university work. And then somewhere along the line

he decided not to become a preacher, and, I take it, decided rather vehemently not to become a preacher; it was more than just a casual decision. However, the religious intent had colored his whole educational career up to that point. And he had, for instance, had four years of Greek and seven years of Latin and that kind of a liberal education as he came up through. In later years Dad wondered if all this helped him. And, of course, in a way it didn't help him too much. It wasn't well designed for his current living. On the other hand, it gave him a good command of language; so he spoke English with almost no trace of an accent and had a perfect command of the English language; so it did benefit him greatly that way.

MERZBACH:

Now, when you were born, he lived in New York state, right?

ATANASOFF:

In Hamilton, where Colgate University is located. And I believe that he finished college after he married mother. Mother lived on a hill adjacent to the university there and was a schoolteacher. And father's religious intent had commenced to oscillate so he'd stop going to the Baptist Church and went to the Methodist Church, met mother, and that was that.

MERZBACH:

Am I right in thinking that she stopped her school teaching after she married?

ATANASOFF:

Yes, just about that time. I'm not sure whether she taught at all or not, she will know, but she taught very little after they were married.

MERZBACH:

What is the earliest -- I understand that you indicated in the deposition that your earliest memory goes back to the birth of your sister when you were about two?

ATANASOFF:

Yes, two, two years and about four months I guess.

MERZBACH:

Two. Yes. What kinds of details do you recall about your early childhood?

ATANASOFF:

Well, [chuckle] I recall a succession of events. When the lawyers commenced pinging on me -- I had never recalled this until the lawyers commenced pinging on me, and I commenced attempting to recall; and I gradually picked up more and more; and it's a surprising experience. I've never been through anything like it. And putting in more than a year of solid effort in trying to recall items from your early childhood; I expect most people will recall much more than they think they will, and there's much more stowed away in a person's physiognomy than is easily accessible.

And I remembered this, when I got to thinking about it, and I realized that they brought her out on a, she was born at home, you know, as most births were in those days, and she was -- and the doctor brought the baby out and dressed its navel on the living room table. Layed it on the living room table, and I remember I had to shove a chair up, they wouldn't let me get too close, but they let me shove a chair up I don't know, my dad was fairly free about such things -- and they let me shove the chair up and I climbed on it and watched them dress her navel, which was a wonderful affair as far as I'm concerned and one that made a lasting impression on me.

BOTH:

[Laugh].

ATANASOFF:

Now I remember a lot of instances of more or less the same period, you know. I remember, after she was born, when she was a few months old, we had to go and get her a highchair, and I remember that trip. And I remember, you know, the fact that we visited a hardware store and I became attached to some pumps.

Now these pumps were old-fashioned pumps with a chain which had buckets on it and would bring the water up from a well; that wasn't too deep. And I had a firm memory of the color and the -- they were red and green ones -- the color and the details of those pumps. And you know sixty years later I found one of those pumps back up there, and I'm sure it's one of the same make. I don't know whether it's one of the same lot, of course, but surely of the same make, and my memory was perfect in regard to it.

MERZBACH:

Your family moved about quite a bit, didn't they?

ATANASOFF:

Oh yes, you see economic conditions then were in bad shape. And dad commenced -- well, he took jobs here and there; he was in Orange and worked with Edison Company before I was born, and then, when I was born, by that time they were back at West Eaton

so that I could be born at mother's folks. And then dad commenced to work for, I remember, for a period in my early days, worked for Utica Gas and Electric company in Utica. And part of that time we lived with my grandparents, and dad just commuted, which was twenty or thirty miles, commuted on a bicycle -- not daily, but weekly, you know. And he'd come back over the weekends. And I remember, mother and I would walk along the bicycle path towards the direction he was coming, to meet him when he would come home. Later we moved to Utica. Dad was studying pretty hard at this time. I know he was studying the gas business pretty hard while he worked there. And then he gradually shifted towards electrical work, and he took a correspondence course with International Correspondence Schools -- do you know the organization?

MERZBACH:

Yes, I've heard of it.

ATANASOFF:

It is quite a -- well, he spent a lot of studying on this. I can remember the effort he made. And they recall the fact that I was kind of bothersome during this period as far as dad's studies went, and I expect that's probably true, although I don't get the full impact of that from my own memories.

MERZBACH:

Well, let's see, by that time, how many brothers and sisters did you have?

ATANASOFF:

Just one. And then -- oh, we can use this as a help here -- here, in 1907 we moved to Deerfield, New York, which is a suburb of Utica. And then sister Florence was born in 1908.

MERZBACH:

That was your second sister?

ATANASOFF:

Yes, and she died. She died at the age of about a year. And my family moved to Lyndhurst, New Jersey in May of 1908. This is one of my earliest memories.

MERZBACH:

Do you remember Halley's Comet?

ATANASOFF:

Halley's comet, that came in at that time. And I think it was 1910, I'm not absolutely sure, my memory is a little bit unfirm about that, it could be '09 or '11 but right in there. In 1909 I entered the first grade at Lyndhurst, N. J. Now by this time we had moved to, up in New Jersey. My father was -- had taken this correspondence course, and was engaged pretty largely in electrical work, and he almost then -- well, let's see, in 1909, well, I was six years old, and by that time Dad began my electrical education. He had always ... Dad was a very peculiar individual, but greatly, greatly, greatly attached to his children, intensely attached to his children, particularly the youngest ones. And spent all manner of time and effort to bring them along and give them a start in life, and it shows in the whole family, it's very evident. One of the formative elements of our family, family was --

Dad, you see, had left Bulgaria, let's see, he was born in '76 and he left Bulgaria in '89, when he was 13. And an uncle brought him to this country. His mother -- his dad had been killed soon after he was born in the Turkish revolution. And his mother had had a couple of other marriages. The first one, dad was pretty pleasant -- part of the first marriage, but that second, but that husband died, and -- first re-marriage and that second husband died, and she married again and Dad seemed to be getting in the way and she sent him off -- and it seemed as if she ought to give him more opportunity and she pulled the gold out of the hem of her dress and sent him to this country. Now, he was left here at the age of 15 alone. I'm coming to that, principally, because this is another element that colored dad's whole feelings and he perhaps ... began a -- if I'm talking too much in any way --

MERZBACH:

No, you go right ahead.

ATANASOFF:

Why Dad -- this led to Dad's feeling of intense insecurity which he possessed all of his life, and also colored his life. He was quite able in everything he did, he did everything pretty well, he was quite a success in every physical thing he attempted, but he didn't have confidence enough to become anything like as well off as he should have gotten to be.

And I don't know whether you, you probably know that there were times in Europe when things were intensely hard, and these were years in the United States when things were quite different than they are today, and when Europe was very prosperous and the United States was not a prosperous country; you should remember that. It comes as kind of a shock to most Europeans. I imagine, in these years, that prosperity of the average person in Europe was far better than it was in the United States. We had intense depressions. During World War I, which came along years afterwards, why, food was actually short in the United States. This isn't understood in Europe at all. It was very hard for an average

family; they had to take a lot of the food for the Army and the United States botching around with activity, with activity in Europe, you know? Military activity in Europe. Why, you know, I don't take things like that too seriously, I don't say that they shouldn't have done it, I don't know whether they should have done it or not. I don't know whether we should be in Korea today or not, I mean Korea, or say, in Vietnam, I don't know; but it's not costing us much. I don't feel the strain of Vietnam very much, do you?

MERZBACH:

Welllll -- you can tell.

ATANASOFF:

Well, some of your associates feel it, don't they, the boys that have to go. Well, some of my relatives have to go, but I don't feel it much. And I haven't. You know most Europeans are opposed to the United States playing around in Asia. This is almost -- you go, go through Europe, travel through Europe, and I haven't exactly done it for this purpose, but I'm sure from the samples that I take that most Europeans think it's -- I have a friend who lives five miles from here, that was, he was the Bulgarian Ambassador to Great Britain, and Bulgarian Ambassador to Rome, and then he was finally thrown out by the Russians when they came into Bulgaria. He thinks it's horrible for the United States to be defending South Vietnam. But then he damns the United States for not defending Bulgaria against the Russians!

MERZBACH:

Yeah, well, that'd be consistent though.

ATANASOFF:

And we come to a kind of a difficult analysis here, don't we? Let's get back on the subject.

MERZBACH:

Yes. One question I had, just, well, to get you started in school. How did you take to school?

ATANASOFF:

Oh, I liked it fine, no great advance, there wasn't any -- I think I was, I hadn't learned to read before I went to school, but I knew a little bit about language before I went to school, and I learned to read very easily and could have progressed much faster. I went and started, you know -- well, I don't know whether you know. Now you studied German as a child, did you?

MERZBACH:

Mhm.

ATANASOFF:

Now did you have any trouble learning to read?

MERZBACH:

No.

ATANASOFF:

Now German is pretty highly phonetic.

MERZBACH:

Yes.

ATANASOFF:

Do you have any idea? You know it wasn't so phonetic till Kaiser Wilhelm got busy on it, you know, in 1910. Do you know about that?

MERZBACH:

In 1910?

ATANASOFF:

1910. Well, Kaiser Wilhelm rectified the German language and straightened it out and got all of its faults perfected, did you know that? Kaiser Wilhelm, he just said to this Institute of his, he says, "Well, get this language straightened out." And so it was.

MERZBACH:

[Chuckle]. Well, I know they had a number of reforms on the language.

ATANASOFF:

And you know the form, and so it became more phonetic.

MERZBACH:

Right.

ATANASOFF:

Now, the question I'm about to ask you, and I might get some advantage out of this. Now you know we have quite a percentage of people, of children, in the United States who don't learn to read very well. Now, do you have such a high percentage in Germany, do you think?

MERZBACH:

I don't know, I don't think so. It's something I've never understood.

ATANASOFF:

I'm trying to find out whether they do, whether this largely comes about because of the highly unphonetic nature of the English language or not. I intend to find out about the German language and about the Spanish language; have you studied Spanish?

MERZBACH:

Just a little.

ATANASOFF:

And it's highly phonetic.

MERZBACH:

Yes.

ATANASOFF:

Even a little more accurately so than -- although German, I don't have much fault to find with German phonetics, it's pretty good.

MERZBACH:

But Spanish is certainly very much so. Yes, well there's the problem with reading and also spelling. Now did that ever give you any trouble?

ATANASOFF:

Oh, it gave me terrible trouble. Well, I was about to tell you, I was about to tell you that,

you know, there were different methods of teaching reading that had been used and one of them was the "look, see, say" system. You look at it and you say the word; you don't attempt to sound it out by phonetic elements. So I learned it that way. And, as a result, I was reading at a phenomenal rate almost immediately, and the lack of phonetic character -- I knew phonetics to a degree, but the lack of phonetic character didn't worry me, but I didn't pay any attention to the shape and form of those words, so I had a terrible time spelling, and it took me most of my college career before I reached a place where I could correct my secretaries.

MERZBACH:

Mhm. How about arithmetic?

ATANASOFF:

Oh well, arithmetic was easy from the beginning, easy, now, you see here -- suppose I just tell a story for a while and then you break in if it fills your need. And now, you see, I started school there in 1909 it says, alright. Then I went through two grades and started the third in the fall of 1911. But in February of 1912, father had had a lot of trouble with his family, having -- being ill with respiratory infections during the winter, and so he moved to Florida, where my uncle was. So I moved down there and I didn't go to school the rest of that year. And then Margaret was born that year, my second sister; two children had died meanwhile;

MERZBACH:

Yes, yes.

ATANASOFF:

and this was my sister who still survives, she was born in Osteen at that time, and then in September I started the fourth grade of school at Osteen. I had only had half of the third grade, but it seemed easy to start in the fourth grade, so I started in the fourth grade. And went until February, and then we moved to Brewster, Florida, where my father then had a position. He had more -- he had a fairly good position there and I continued the fourth grade.

MERZBACH:

That's where he was with that phosphate ?

ATANASOFF:

Phosphate mine. Phosphate in Polk County, Florida where there are many phosphate mines, and he had a position as electrical engineer for the Phosphate Company. And he --

so we lived there a number of years. Now when I went to Osteen I had -- I finished the fourth grade that spring, and in the fall, when I got ready to go to school, they had a new teacher there. And you might, we might just record the new teacher's name -- it was Miss Gertrude McArthur; because she was a woman of intense aggressiveness and of some impact. She was a good teacher, among other things. So the question was, should I -- I hadn't had full fourth grade, so they wondered if I should go back in the fourth grade, but I wanted to go into the fifth, so they said they'd try it, so it consequently happened that I came under Miss Gertrude McArthur. It was a two-teacher school; so the fifth, six, seventh and eighth were carried by one teacher, and one, two, three and four were carried by the [other] teacher. So I got into the higher section of the school, in the fifth grade, and then my mathematics commenced to develop pretty rapidly. This teacher would let you move as fast in mathematics as you wanted to and it didn't worry her. She just let you fly, and she not only did that, but she'd beat on you to make you fly. And thus impelled forward, much beating on. Do they beat on children in Germany?

MERZBACH:

Literally beating?

ATANASOFF:

Yes, well do they beat on children in Germany?

MERZBACH:

Well, I don't know.

ATANASOFF:

You didn't experience that? Well, the facts are that in those days -- she didn't just say, "Do this or I'll beat you," but there were various continued circumstances, to be sure -- but my mathematics commenced to improve pretty rapidly and pretty easily as far as I was concerned. If I wasn't -- she encouraged me to keep busy at that, because if I wasn't busy at that I was giving her trouble.

And I remember that I have some imagery from this period. At that time we were living in a house, which I remember quite precisely, and I know events that happened there, because I have largely a visual memory, and I can see the surroundings, as I am reading a book, I can see the surrounding, where I am, in my memory. And I remember sitting on the front porch of that house in 1913 and studying radio for a good many hours. And I remember distinctly exactly what books I was studying from. I remember they're on -- Well, there weren't books on radio at that time, but my dad had procured two little pamphlets from England on radio; and one on radio telegraphy and one on radio telephony. And I was studying those books. And the contents of those books, and the color of the pages and things like that come vividly to my memory. And I was sitting on

the front porch or in that house studying those books, and of that my memory is clear. And this was in the year 1913, February of 1913, when I was ten.

Now at that time, I might just say, this was beside the school effort, I was studying the slide rule during this period. My dad had two slide rules and he didn't use them very much; he could use them, but he didn't use them very much. So a new slide rule, and a new instruction book was around and I immediately taught myself to use the slide rule. I didn't understand trigonometric functions, but I used the other part. You've used a slide rule, haven't you, so you are familiar with what I'm talking about. It was a slide rule not too much different from this. This is a cheap slide rule, but it was the same layout of scales that this has and you reversed the slide like that, it wasn't one of the newer type. I had two of them, one of them was made by Keuffel and Esser?

MERZBACH:

and Esser, yes.

ATANASOFF:

And one of them was made by Dietzgen. And I remember the Dietzgen had a red case, and the K&E slide rules had a black case; and those items I remember, and they were telescoping cases. Well, I was very intent, I would go out to play a little while and then I would come back, and this went on and on and on. I would go out and play for an hour and then I would come back in and study, and I don't know why. Probably, probably, if you want to know, maladjustment. I had a good time when I was out, I don't remember if there was any difficulty. I had scraps with some of the boys and girls around, but I don't remember any of them. But in some way I was intent that I should do something with these slide rules. Now, pretty quick there was an explanation in the book on slide rules and logarithms. It spoke about logarithms to base two. So, pretty quick I could understand how eight'd be, have three to the base two, and so on. Then I, pretty quickly I -- it was written in a pretty elementary manner -- and pretty quickly I understood that. Pretty quick. But I would try to get the logarithms of seven and I could not see how to do it, and this tortured my soul. And how a thing like this can torture a boy of that age so much, I do not know. But this continued to torture me, and drove me very hard. And in the course of the next two years, independently of the school, and without any knowledge on the part of the teachers that I was doing this, I studied books on logarithms, on trigonometric functions, and in the end came not only to be able to take logarithms out of tables, but during those two years I learned how, by means of series, modifying them with the factor that you have to -- logarithm of base e to the base 10 -- I remember that conversion factor, logarithm of 2.30, you know, that conversion factor took me two months to get on to it, what in the world it was.

MERZBACH:

And this was still between, say, 1913 to 1915?

ATANASOFF:

Let's say '13 to '15, yes, between '13 to '15 I did this. And

MERZBACH:

Including the actual conversion?

ATANASOFF:

it's almost -- incl -- oh yes, including expansion.

MERZBACH:

Yes.

ATANASOFF:

And I have a book here and that's the very book I studied. And it's almost unbelievable. And I avoided saying this in my, I had a chance to say it, but I avoided saying it in my testimony, because it scarcely seems credible. I know most people will regard this as some kind of either fabrication or a mistake on my part, but it is not a mistake nor a fabrication, it is simply the truth. Now in school I was making rapid progress. Mother is a, is a -- was just a public school teacher, she'd had Normal training, but she has always been very good in mathematics. Dad was good, but dad didn't have -- by this time dad had less patience, he had younger children and less patience with older ones, but mother had infinite patience, and often she would help me a little bit with algebra. I don't remember that she had much to do with this logarithmic episode, but I know that in numerical algebra she helped me quite a little bit from time to time. And that went on until perhaps I was in the seventh grade, and then all that vanished and I proceeded by myself; say about the year 1915 or '16.

BOTH: [Digression on tape speed].

MERZBACH:

One question about this school: you mentioned that it was divided, and the two teachers split up the elementary school. Now did this mean that you were in the same class with the other grades?

ATANASOFF:

In the same room.

MERZBACH:

In the same room, I mean.

ATANASOFF:

Oh yes. And the classes would come up to the benches in the front and recite. And as far as, I never recited much in mathematics, I would just work problems, and then she'd take them up and tell me to work all the odd problems on the next page, and I'd work all the odd problems, and this went on and on and on. Now, when I was in the seventh grade, I finished the first two years of algebra.

MERZBACH:

This was under the same teacher?

ATANASOFF:

Under the same teacher. When I was in the seventh grade, I finished the first two years of algebra, and there is a woman alive who was in the same class with me at that time. And her name is -- was Gladys Latimer -- and her name is now Gladys Turner, and she lives in Lakeland, Florida, and she remembered the episode, she has a very clear memory, and she remembers the episodes of this time. And she was in my school at that time. Nobody else, there's no one else that'd remember the events, and Gertrude McArthur is dead, of course. But Gladys Turner would remember all of these events, remember my -- well.

MERZBACH:

There's -- well, another question. You mentioned in the deposition that you started reading about computing machines about that time?

ATANASOFF:

Oh, you know, I read encyclopedias. And computing machines, computing machines -- oh, every time I got near a computing machine, having gone through the slide rule, every time I got near a computing machine I ran it. Now they had two or three computing machines around the office for business purposes. Around the office. I -- they had a Felt & Tarrant Comptometer; do you know the --

MERZBACH:

Oh yes, oh yes.

ATANASOFF:

And they may have had a Monroe. I remember the Comptometer very well, they had a large computing and listing machine, too.

MERZBACH:

Full keyboard?

ATANASOFF:

Yes, yes. Right. And I learned the Comptometer subtracted by, you know, what do we call it? The complements.

MERZBACH:

Complements.

ATANASOFF:

Yes, throughout subtract with complements, and I remember I learned how to do this, and worked on occasional visits to the office, when, on off hours, when nobody much was around, and they all treated me nicely and let me play with the machines if they had them in there. But I remember reading during these years, now I hesitate to say, it might have been about the year 1915 or '16 or '17, I remember reading the *International Encyclopedia* on the subject of computing machines. And, you know, it comes back to me, but that first page of that and the pictures of those encyclopedias come back to me, I presume that I've seen them since, but I remember, and I remembered something called Chinese Bones. It was an elementary computing machine which is contained in the first page of this article which I read at that time. And then, in years soon after that, I commenced to read the much better *Encyclopedia Britannica* article on computing machines. But I always wished I had a computing machine in those days.

MERZBACH:

Were you, aside from that though, were you interested in building things much at that time?

ATANASOFF:

Well, you see, yes. All my life I've had easily -- you know, this.

MERZBACH:

Yeah.

ATANASOFF:

And perhaps more than most engineers. Well, you see, I've a lathe out here now, and it's just because of that tendency in me. I want to do things with my hands, and then I want to do theoretical work, and then I want to do things with my hands and theoretical work, and it's a very happy combination. All my life it's been happy, because, you know, most engineers don't know enough about how to make things so that they can draw plans that anybody else can make, and it's a very difficult translation problem. Even draftsmen draw things that mechanics can't make. But I never had that difficulty. And at an early time, dad always had tools around the house, and I learned to use tools at a very early age.

MERZBACH:

Mhm. When did you have your first taste of geometry?

ATANASOFF:

Well, let's see. Now you see I finished the two years of algebra in the seventh grade, and I was in the fifth grade, and I went right along, there was no missing any. Then, seventh grade at Brewster, in 1915, all right, then we moved out to Chicora, out in the country. And I went to a country school and didn't take any mathematics that year. I knew I was pretty well up. But in 1917 I came back to Brewster and did a one or two month review of algebra, and took geometry and Latin. And in 19-- '17, now, let's see there's something wrong in here. This is '18 and '19. Yeah, this is '18. '18 and '19, '19 and '20. Right. That's all. Just a typo error. I spent two years at Mulberry.

MERZBACH:

Did you have any preference, you know, choosing between algebra and geometry?

ATANASOFF:

Well, they were just terrifically easy, both of them for me. Always just so easy, and they were so easy for me that I took geometry there. But in high school I never took any mathematics, because -- and, as a matter of fact, I just studied trigonometry by myself and I went up and took an examination and they gave me credit for it. And then, later, I studied solid geometry and went up and took an examination; just studying those by myself.

And after I got out of high school in June of 1920, why, I had to work, my family wasn't in very good circumstances, and I had to work for a year before I went to college. And I worked in a phosphate prospecting camp where we lived in a camp and I remember studying solid geometry by campfire. This is another sharp image. But I had no trouble passing courses after I had studied them for a short space of time by myself. And then you see in '20/'21 I worked. But in the fall of '21 I went off to college.

MERZBACH:

Just before we get into this. Did you have any science in high school?

ATANASOFF:

Oh yes. Now let's see what I had. I had physics in high school here at Mulberry. But I should tell you that I guess I got one of those books that I studied, of my father's, long before this. And I studied physics; I studied three volumes of physics that my father had. One elementary physics which was an academic course, and then I studied by myself an advanced college course, a two-volume physics course. And I studied it very thoroughly and I memorized every page of it. Many pages I can recall the shape and the illustrations that're on it. One volume of the second set I have here, and I don't know what's happened to the other volume. And I studied my father's chemistry, and I studied my father's astronomy, and a book on surveying, I remember. And I learned much more this way than I did from any course in high school. But the results were that when I took physics in high school it was a mere formality, and the teacher asked me, if there was any difficulty, always asked me what the answer was. And the man's name was T.W. Yarborough who taught that course. He was the principal of the school and they couldn't get a science teacher, so he had to come down to teach the physics course himself.

MERZBACH:

Mhm, mhm. Now this reading that you just outlined, you did while you were still in high school, before you went to the University? The surveying, and the physics, and the chemistry?

ATANASOFF:

Oh, before I even went, most of it before I even went to Mulberry. In these years, these good years in my life, between, let us say, between 1913 and 1918, when I began a good start on mathematics, and a good start on physics, and a good start on chemistry, and a good start on astronomy. And I've always [learned most,] almost all of this, most of this, by my own effort; even when I was taking these courses in school, why the teacher had little to say to me and I was just laboring by myself off over in a corner.

MERZBACH:

You went to Mulberry two years, didn't you?

ATANASOFF:

Two years, yes; it was 1918, 1919, 1920 yes.

MERZBACH:

That means -- did you go to Brewster through the tenth or was it --?

ATANASOFF:

Yes, you see I went to Brewster through the seventh, then I went to Chicora one year.

MERZBACH:

Right, and then you went—

ATANASOFF:

and then I went back to Brewster, and went, well, one or two years, and I'll have to figure out, because I --

MERZBACH:

Yes, I noticed this also in going over the deposition, somehow there seems to be a year missing; or was it an 11-year school?

ATANASOFF:

It was a 12-year school. MERZBACH:

A 12-year school.

ATANASOFF:

Now you see I had two years at Mulberry. Now the question is in 1915 I was in the seventh grade, '15/'16, seventh grade. Now I know I didn't miss. And then I was at Chicora -- 1915/'16; now in '16/'17 I was at Chicora. And then we leave some space, and '18/'19 I was at Mulberry and 1920 I was at Mulberry. Now I know I have my high school graduation diploma here, so this is certainly a fixed date. And that I am sure is a fixed date. So we just have to fill in here, with, well I was only 1917/'18, isn't it? '17/'18, that's only one in Brewster again. So I only went back to Brewster one year.

MERZBACH:

Well, that's still --that's still -- see: 7, 8, 9, 10, 11. That still --

ATANASOFF:

Oh, pay no attention to that, I just did it in eleven years. It was a twelve-year school, I just did it in eleven years.

MERZBACH:

That's, that's what I was getting at.

ATANASOFF:

Yes, that's what happened.

MERZBACH:

That's what must have happened. [Laugh].

ATANASOFF:

But you see I wasted a year at Chicora besides that, and it was no trouble. The only thing I had trouble with was Latin.

MERZBACH:

Mhm.

ATANASOFF:

And English.

MERZBACH:

Aha, so the languages –

ATANASOFF:

English and Latin.

MERZBACH:

And that stayed with you later? I mean were languages more difficulty than other --?

ATANASOFF:

Yes, yes and I didn't have much motivation in regard to languages in those times.

MERZBACH:

Mhm, mhm.

ATANASOFF:

And I was tremendously motivated in science and mathematics and those things just absorbed my energies. And there are a lot of stories about the language. However, I knew that I had to do English, and so English got special treatment from me. Not motivation perhaps, but [laugh] pressure. But now we're about up to college days, aren't we?

MERZBACH:

Yes.

ATANASOFF:

Do you want to go ahead with college now, or do you have any questions you want to cover about what's gone before? How do you feel?

MERZBACH:

We're fine, we're fine. We've covered the things I did have questions on. There's one thing in connection with the surveying, although I was going to pick it up later, because I think later on you also did some work, summer work, in surveying. I was curious, did you, for example, when you studied surveying, you know there's again the question of the instruments,

ATANASOFF:

Yes.

MERZBACH:

did –

ATANASOFF:

I never touched an instrument, but when I had studied the book I could always use the instruments.

MERZBACH:

Aha. ATANASOFF:

It's funny, I often mispronounce words. The reason I mispronounce words, almost all the words that I know, I learned by reading, not by hearing and -- so everything I learned by reading. And I learned to survey by reading, but, of course, so far as -- I could always use

a surveying instrument; from the first time I ever touched a surveying instrument I could use it, use it perfectly. I knew where everything was. I had memorized everything out of the books.

MERZBACH:

Yes.

ATANASOFF:

And, of course, I took surveying in college per force. But I had no difficulty with that kind of thing. [Chuckle]. Well, in the fall of 1921, after having spent a year working and saving five hundred and thirty dollars for a year's hard work, saving almost everything I got, making a maximum salary of three dollars and a half a day, and not too regularly, either, I entered college. And, of course, it was a wonderful period of my life, because I got back, then I was commencing to pull together loose ends. I'd been really living two lives, the ordinary life which people live, of contact with their schools and other things, and a second life of studying by myself, which I'd been wanting. But now the two were commencing to join, you see, and the results were bound to be intense and profound. I knew I was very I was, I knew I was going to be poor in English and so I knew that that would require special attention; it got it. As a result I made the second highest grade in the freshman English class. And my sister reported this to the teacher in high school and she said that the University of Florida had a poor English course, which is the normal conclusion, I presume [laughter]. Well, everything came easy for me, and I commenced making, well, very high grades, very high grades, in the University. And I was systematic and I went through the drudgery pretty well, too. I taught myself to do that during these years, by myself, I'd taught myself to go through the drudgeries of life, and habits don't change easily and quickly. We have in the house here a copy of my record from the University of Florida, of my scholastic record from the University of Florida, and my scholastic record as a graduate student. I didn't find it, the lawyers went and dug it up.

MERZBACH:

Yes, I gather that.

ATANASOFF:

They dug all this stuff up.

MERZBACH:

What -- did you have any favorites in the college course?

ATANASOFF:

Everything.

MERZBACH:

Everything.

ATANASOFF:

Including even machine shop and woodworking. And I loved woodworking, and I loved machine shop, and I loved -- they even taught engineers -- there are some subjects in those days that they don't teach anymore, because other new subjects have crowded them out, such as foundry. I even loved foundry and can go into a foundry and do foundry work today, I've tried it. And after all these years my intense memory of my course in foundry -- and machine shop: I learned machine shop while I was in college in those years. It was a fairly intensive experience. And so that later on, when I owned a company, when I owned a company myself, and had machinists who were having trouble meeting specifications, I could go back there and lay out the work in a different way so that they could meet the specifications; and I've done it a number of times.

MERZBACH:

Yeah.

ATANASOFF:

And, the -- of course, I took engineering, I took electrical engineering. I was very, very fond of the courses in electrical engineering. I was hard up financially, so that I didn't work the first year, but the second year I commenced waiting on tables to earn my board. And -- then I worked during the summer, of course, in between, at whatever work I could get. I remember the first summer after my freshman year I got sixty-five dollars a month, I remember that.

MERZBACH:

Was that that job inventorying?

ATANASOFF:

Yeah, job in a storeroom. Then I, in the middle of my junior year I was still waiting on tables, .. maybe, I may be wrong, maybe I didn't wait on tables in my junior year. But, at any rate, during my junior year I was waiting on tables and I got a call from the head of the, from the principal of the high school in Gainesville, Florida. Have you got any notes on that?

MERZBACH:

Uhm.

ATANASOFF:

You're doing fine, aren't you?

MERZBACH:

Mhm.

ATANASOFF:

I got a call from him and what had happened is that a teacher had gotten involved with a college boy and was going to have a baby, so he was without a science teacher. He was without a science teacher and how he hit upon me I am at a loss to understand. I said, "Why don't you go to the College of Education?" which had lots of students there. He said, no he didn't want to, he wanted me. His name was Fritz Buchholz. His father had emigrated, a German immigrant to this country, and had been a superintendent of public instruction of Hillsboro County, where Tampa is. And then later he gravitated to the University of Florida, and his son graduated and became a principal of a high school in Gainesville. He said, "No", he wanted me. I said, "Well, you know, I don't have any certificate." He said, "Well, there's going to be an examination in two days, and I think you should go down and take it." I said, "Well, gosh, you know, they're going to ask me a lot of subjects that I've never even taken, I can't pass that examination." He said, "Go down and try it and then, after you've failed, why, I'll get them to issue an emergency certificate for you." So I went down and took the examination. With two days at hand, I just quit college for two days and I had to take three subjects, agriculture, physics and biology. So you know along the way I had read everything I could lay my hands on on agriculture, so I knew I had some degree of competence. Because other people don't read as fast and don't learn as well when they read as I do, and I was aware of that.

MERZBACH:

What made you read up on agriculture?

ATANASOFF:

Well, because we were near farms in those days. And .. so I knew all the current theories about agriculture; they wouldn't, and that's still true. I know all the current theories today and I take advanced publications in agriculture today. Pretty advanced. I take the publication written by the Agronomy Society. Currently I'm subscribing to that. Well, alright. So I studied biology. I knew biology was tougher, so I studied biology assiduously for two days; just read, read, read, read for two solid days. OK. I went down and took the examinations and I made a 100 in physics and 94 in agriculture and 83 in

biology and passed. And those grades I remember perfectly, I'm sure those are the exact grades if you could find them. I know exactly what I missed in .. in .. in agriculture. Oh, I've never seen a Babcock milk tester; do you know what a Babcock milk tester is?

MERZBACH:

No-mh.

ATANASOFF:

It's a device for determining the amount of cream in milk, the amount of butterfat in milk. The only thing I knew about a Babcock milk tester, is what I -- they gave me five questions and that was one of them, "describe the Babcock Milk tester and its use." And I got 14 out of a possible 20 on that question, and I got it all out of Sears-Roebuck's catalogue.

MERZBACH:

Really. [Laugh]. From Sears Roebuck.

ATANASOFF:

And -- the other questions, the other four questions I got somehow from my knowledge of agriculture, I knew rotation of crops and this sort of stuff. And I'd studied, [laugh] I'd studied [eco]logy. And I remember that in botany they asked me what use gardeners make of adventitious roots. That was one of the questions in biology. Adventitious roots! Now that comes back, but I can't tell you any more.

MERZBACH:

OK. Going back a minute: Now, you took the degree in electrical engineering. What made you decide that?

ATANASOFF:

Well, you know, science. I became aware, actually I knew I was going to become a theoretical physicist by the time I was, by the time -- by 1915 or '16 or '17. By that period I knew I was going to become a mathem -- a theoretical physicist. The question was how.

MERZBACH:

And why?

ATANASOFF:

And why. Oh well, you see, I liked mathematics and I liked the theory of these sciences. And I liked the theory and I was very intense about the theory. So I knew I was going to become a theoretical scientist! Now the question was how. Well, if you look at the University of Florida, I chose exactly right. And how much of it -- now this is hindsight I'm uttering at the moment. I don't know exactly. If I'd have majored in physics, you couldn't have gotten any subject matter; engineering, they'd developed it more. So I kept myself very busy and I -- oh, did you know, I don't know, I'll tell you this. There's other precedents. You know P. A. M. Dirac is about my age. He's a couple of years older than I. And P. A. M. Dirac was an electrical engineer at Birmingham,

MERZBACH:

Mhm.

ATANASOFF:

I can tell you that,

MERZBACH:

Yes.

ATANASOFF:

until he graduated. And there, there are other -- there're quite a few people around that took electrical engineering during this era. You see, that was in England, of course. But it just shows the wherewithal that was available in those days, a little bit. I, of course, I didn't know anything about him at that time, but we just happened in more or less the same course, but I'm well, not, not in the Northeast, because you could find advanced courses in physics, but in the outlying fringes of the world, why, you could proceed better by taking this, and to a degree, and I, I don't know how much, but to a degree I knew it.

MERZBACH:

That this was the best course.

ATANASOFF:

That that was the way to go at it. And then, you know, when I graduated, why you know I went into mathematics and majored in mathematics and got a Master's degree in mathematics. Because to lean the other way a little bit, I earned money teaching in high school. So let's go on about college for a little bit more. I earned money teaching in high school and this loosened up my financial position so that I had maybe \$400 a year to go to college on. And \$400 a year was a pretty, a pretty good sum in those days. And I also, while I was a senior, I took some post-graduate work in mathematics, we had a pretty

good mathematics instructor, his name was T. M. Simpson, and I believe he's still alive. And he, and he – one day he had to put in a course in actuarial mathematics, and so he didn't have an instructor for it; and he says, "Atanasoff, why don't you teach this." I said, "You know I've never had actuarial mathematics," and he said, "Just forget it, and go ahead"; and then he gave me a fifteen-minute lecture on the principles of teaching.

And he says, "You'll make a mistake," he said, "you'll cover up your enthusiasm, because you know that people laugh at you for being enthusiastic all your life; don't do it in class, because it's an asset." That I remember he told me. He said, "Let your enthusiasm fly." That's most of what he said; that was -- some other things, but that's most of what he said. And I started teaching for him, as well as in high school, during my senior year. And I taught this course in actuarial mathematics and to this day I'm good at actuarial mathematics just from having taught that subject. I mean I can pick up a table, you know, annuities and all that stuff, and I've got it all memorized and it's all stored away and permanently there. And I often make calculations on interest rates and things for people, just because I can do it so easily and they seem to have so much trouble with it. Annuity simple and annuity due comes right down from that day. Did you ever have actuarial mathematics?

MERZBACH:

No, I did -- well, I also -- my only actuarial exposure was that I was an assistant for a course at Texas and in that sense, you know –

ATANASOFF:

A corresponding time, yes.

MERZBACH:

but I never did any formal work in it myself. There's one question I have, there is some reference in the deposition that you took Contracts?

ATANASOFF:

What's that?

MERZBACH:

Contracts?

ATANASOFF:

Oh yes.

MERZBACH:

How come?

ATANASOFF:

You know engineers get a course in contracts. Even today you'll find them doing it in a good many engineering schools.

MERZBACH:

I see, I see.

ATANASOFF:

And in addition to that I took psychology, as an added interest and on my own, I took psychology, I took economics.

MERZBACH:

Yes; those were electives.

ATANASOFF:

Yes. I just ranged, you know. And I took, I only had one course of chemistry, but I took analytical chemistry, and I took -- wait a minute -- I took, quantitative analysis is what I took -- well, qualitative analysis. Qualitative analysis is what I took, I took qualitative analysis, and I took organic chemistry in addition. And those cost me something too; or, qualitative I could just -- oh, almost no effort at all, but organic -- trouble!

MERZBACH:

Really?

ATANASOFF:

You see I had to work for this, I had to start working, again.

MERZBACH:

What was it about organic that -- ?

ATANASOFF:

Well, let's see, if you know, there's an infinite detail that you have to memorize. You

have to discipline yourself pretty hard. All I learned in those days is all the organic I know today, but I knew it pretty well, but it cost me, I remember that. And probably I only made 88 or 90 in organic, but we can find out from the records.

MERZBACH:

I gather you were fairly active at the same time in general activities?

ATANASOFF:

Yes and no. [laugh]. In the first place, I did, I was elected head of the Engineering Society and a member of the Debating Council. But on the other hand my social life was sketchy, very sketchy. The University of Florida was not a coeducational school in those days. And there, there aren't but 24 hours in the day, and I made very intense friendships during this period, so that social life wasn't lost or anything. And then, you know I graduated in the spring of 1925, and in the summer of 1925 I stayed on at the University of Florida. I knew that I needed to know modern languages if I was going on and take advanced work. So I planned to audit two courses in modern language: German and French. I audited them. I didn't do very well in them. I was simultaneously campus electrician.

MERZBACH:

[Laugh].

ATANASOFF:

And I knew I was auditing them and didn't put in too much time, and then by some hook or crook they recorded a grade for me in French and I got 25. 25, a fail grade. Now I suppose that I'd better follow the sequel to this. Now German, after I got off into graduate school -- let me just give you, just follow the language theme for just a moment -- after I got off in[to] graduate school I took a reading course in German and learned to read German very easily, and still read German rather easily. However, I didn't touch the French until -- you know, here's a teacher and she doesn't know what to record, and she filed a grade and they turned it in, so that's the way it was. I, all of a sudden, realized that I'd come to a due date and that I had to have a reading knowledge of French -- of another language, presumably French in those days. And I was at the University of Wisconsin, and it was two weeks away from the due date. And I had no French at that time except this French in the summer that I made 25 in. So I studied French solid for two weeks and went up and passed the reading knowledge examination up at the University of Wisconsin. So I say, maybe I've learned more French than I thought I did.

MERZBACH:

Sure. Mhm.

ATANASOFF:

You know, and the man said, "I can't understand it," he says. "You're one of the most peculiar readers of French I ever had, but," he said, "you certainly can read."

MERZBACH:

[Giggle].

ATANASOFF:

I didn't tell him the story, I was afraid he might back out of passing me. But I learned it all really in a very casual summer with a lot of social life, and also a lot of activity as campus electrician in which I was the sole man to repair the pipe organ; I remember this distinctly. The pipe organ wouldn't pipe, and then I would go in and work on it until it did and this would go on over and over all summer long. They had just got a new pipe organ, brand new. They brought it from Belgium and it had wooden works, and the wooden works got down to the humid climate of Florida and commenced to swell and this was the reason that it just wouldn't work. Well, now that kind of brings us to the end of our college career.

I made honorary societies, those that were around. I made them alright in those days. And then, I might just add, parenthetically also, as well as this episode about, that many years later, oh, say eight or ten years ago, the University of Florida elected me a member of Phi Beta Kappa in absentia. And I was taken into the Chapter at Johns Hopkins.

MERZBACH:

Aha.

ATANASOFF:

Well, having an evil mind I suggested -- I knew there was a new chapter of Phi Beta Kappa down at Howard University. And I suggested that I be inducted at Howard University. But the University of Florida professors could hardly come to this and they suggested Johns Hopkins instead. End of parenthesis.

BOTH:

[Laughter].

ATANASOFF:

Now we have more or less covered this situation up to the end of my college career. Let's

see, I don't know whether there's any other general observation. It was a very intense period of my life, and a pretty good and fruitful period, and I made good progress. I was a wild-eyed scared kid, a wild-eyed scared kid, but then, after people knew me, I got along alright. I tried to get a Rhodes Scholarship, but they didn't give the Rhodes scholarship the year I graduated. I'd made an application the previous year and they wouldn't give it to me the previous year. And the Rhodes scholars committee at the University of Florida were pretty largely addicted to athletics and I didn't have any athletic prowess, and by this time I had passed through baseball and football and had gone on to other things; and I have never given them any attention since, not one minute. Do you read the football scores everyday?

MERZBACH:

Not every day, no.

ATANASOFF:

Well many people do, you know.

MERZBACH:

Yes.

ATANASOFF:

And I don't give a damn in hell what happens in football.

MERZBACH:

Were you active in high school in sports at all?

ATANASOFF:

Very little.

MERZBACH:

Very little.

ATANASOFF:

Very little, yes. I wasn't interested. I just had no emotion in that direction. And very possibly would have had no skill in that either. Although that wasn't tried.

MERZBACH:

Perhaps it would be a convenient time for a break.

ATANASOFF:

Yes, we can break.

END OF SIDE I

[BEGINNING OF SIDE II]

ATANASOFF:

In 1925, I had graduated in the spring, in June, and I had spent the summer attending to my modern language requirements in a kind of disastrous way, at least a casual way. And during these months I had been trying to reach a conclusion as to what I should do next. And you know, I was offered jobs with the companies, for instance, Westinghouse, and General Electric, and Bell Telephone, all offered me positions as an electrical engineer. And they even unbent to the extent of giving me ten or fifteen dollars a month more than they would the typical graduate. I remember that Bell Telephone offered me \$125 a month to go to work for them, which was a very high emolument for a graduate engineer in those days.

But it was pretty clear to me, as I have said, that I was going into theoretical work. And so I felt that I should sharpen my mathematics. I suppose I was somewhat influenced in this by T. M. Simpson, Dr. T. M. Simpson, this professor of mathematics at the University of Florida; afterwards he became Dean of the Graduate College of the University of Florida, a very prominent man there and a very persuasive teacher. And so I commenced applying for fellowships and the like to support a graduate career. And I had turned out a lot of applications. And I finally got one from Iowa State University, then Iowa State College. I was rather slow in accepting it, but I finally did accept it, and two or three days later I was offered a very handsome appointment by Harvard University, and I was too honest to renege and I took the one at Iowa State University.

Now along in September of 1925, I was traveling by train northward through Chicago to Iowa State College, arriving at Iowa State College on about the 20th of September. And I had this appointment as graduate assistant in mathematics, paying me the sum of \$800 per annum, on which I proposed to support myself and study mathematics with a minor in physics. Well, it worked out just this way. At the end of the following September, no, at the end of the following August, I got a Master's degree. And I continued, I was then given an instructorship in mathematics at the salary of \$1800 per year, that is, for the academic year of nine months; \$200 a month, and that looked like an easy life; not for very long. I continued at Iowa State College doing graduate work, in every way I -- taking whatever courses, I could.

And along in March of 1929, I transferred, in the spring, to the University of Wisconsin to become serious, to begin serious work for a Ph.D. It was proposed that they give graduate degrees in physics and mathematics but they had never done this, and I thought I would prefer to go to the University of Wisconsin, where graduate work in mathematics and physics was a more serious thing. I got an app -- I really commenced to major at this time in theoretical physics, minoring in mathematics. This was a blow to Dr. H.W. March, who was a friend of the head of the mathematics department at Iowa State University, and who became immediately a friend of mine. And it was a blow to him that I would take physics instead of mathematics, but I took as many courses as he could give and this softened the feeling between us and we remained good friends.

MERZBACH:

What kind of mathematics did you take at Iowa?

ATANASOFF:

At Iowa? I took everything. Such things as -- oh, let's see. Advanced algebras, ..., oh, such things as celestial mechanics, differential geometry, projective geometry, theory of relativity, and then atomic physics, x-rays, partial differential equations, a great many other things; I'm sure that I'm leaving a lot of things out. The number of courses -- they had collected a fairly good staff there at that time, and all the staff were eager to give graduate courses. And they gave the courses -- I don't think it ever mattered to me too much who gave a course, if I had reference material -- such things as the theory of real variables, and theory of complex variables. And I had a -- as a matter of fact, Iowa State College was in those days blessed by the finest librarian, finest University Librarian, in the United States, most aggressive, and he had collected -- who happened to have an interest in mathematics and physics -- and he had just furnished us with the very, very best literature and it was freely available. And at no other place did I get the service and the quick response of a University Library that I got at Iowa State College during these days, and it made a great deal of difference in what I could accomplish. And almost as soon as I got there, I commenced moving into more advanced mathematical theory. You know how complex such things as Dedekind cut theory and all of that stuff is. And I just lapped it up and I loved it.

MERZBACH:

What caused you to, how did you decide in choosing your Master's, your thesis topic?

ATANASOFF:

Well, one of the members of the faculty -- well, as a matter of fact, by this time I really did a Master's thesis in theoretical physics, didn't I?

MERZBACH:

Yes.

ATANASOFF:

Well, one of the members of the mathematics department was ready to try anything and he fathered it, and his name was Edward S. Allen; and I got a call a couple of months ago from Edward S. Allen, who was in the Washington area. He has a son who is a member of the staff, he is in charge of reference, of Congressional Reference work at the Library of Congress at the present moment; his name is Julius Allen. Julius Allen, and he -- and the father was there visiting him. But he would take on anything. And I did this because I had developed a very intense interest in a very powerful theorem which has had a long and illustrious history. But mostly since my interest in it occurred -- the Virial -- Das Virial of Clausius. Do you know the Virial of Clausius?

MERZBACH:

Well, I, I didn't have -- I didn't

ATANASOFF:

You looked it up, did you?

MERZBACH:

Right. [Laugh].

ATANASOFF:

Well, it turned out I read it in the original German, I remember that. And I read Clausius, and I read, how many times ten or twenty times in the original German because I just had to get Clausius's original feeling for it; and then I did. And then I felt as if it had by no means accomplished what it should in theoretical physics and this is what was on my mind at the time, and Dr. Allen was always an accommodating man. So I was able to turn it into a thesis, not an illustrious one but a satisfactory one, of which, considering the later history in this field, I feel rather proud. Because it turned out that when we came to the further theory of the equation of the state of gases, in the terms of the Dutch, the Netherland School, Kamerlingh Onnes and his followers, they used these exact methods, and my work was just ahead of that. And so I felt rather that my judgment in physical things was growing, you know, and it gave me a little impetus for it. Well, the truth is that Dr. Allen was, among all the members of the Mathematics Department there, he was the most intellectual. So I was glad to work with him.

MERZBACH:

Did you do any work in statistics?

ATANASOFF:

I never have had a course in statistics to this very day. I will tell you this, I have read some books. And as consequence of this I carried out, they had at the Iowa State College an illustrious club called the Osborn Club. And it was many years before I gained entrance into the Osborn Club. The first meeting at the Osborn Club, there was a paper given by a statistician, and the statistician is a statistician who is today of international repute. And his name is Cochran. He is now Head of the Department of Medical Statistics at Harvard University. And I opened my big mouth; it irritated one of my superiors intensely, that on the very first day that I entered the club I should open my big mouth. And I got into a knock down drag out argument with Dr. Cochran on his specialty and my reading-knowledge-only course. And do you know I was sure as I left there that I had completely licked him. I understand the inner feeling of statistics very –

MERZBACH:

When was this?

ATANASOFF:

When?

MERZBACH:

Yes, approximately.

ATANASOFF:

Approximately, let's see if I can tell you approximately. [short pause]. It was about 1932. And I knew Cochran's professor, who was R. A. Fisher.

MERZBACH:

Hm.

ATANASOFF:

I knew Fisher, and I have, oh, I attended his lectures to some length. I did do that, I forgot that, although I never had any preliminary work, but I read a good many books in it. But I have a strong feeling about statistics and a very keen appreciation of the importance of statistics. And I have had pleasant relationships with a good many current statisticians like Tukey, do you know Tukey?

MERZBACH:

Mhm, mhm.

ATANASOFF:

I haven't seen him much lately, but I, you know, every time I get in contact with people like that it seems as if we would get along well and our relations would be close. We had a statistics department which was growing and doing things at Iowa State College, but I considered it beneath my attention, and I presume it was. I presume in reality it was, until R. A. Fisher; they got R. A. Fisher to come there and lecture, and I attended his lectures there, but until he came there, the people there just didn't have the power, the grasp, to have this inner feeling of the importance of the body, of the substance of the stuff, you know. And this is a -- But R. A. Fisher was a joy to me, he was just out of this world. And then later on -- another parenthesis: later I went to Cambridge, England, and he gave, Dr. Fisher gave a Tea for me

MERZBACH:

Oh.

ATANASOFF:

at Cambridge.

MERZBACH:

Aha.

ATANASOFF:

And he sent one of his students to show me around Cambridge, and you know where the river Styx washed the labels off the bottles, have you heard this?

MERZBACH:

What's this?

ATANASOFF:

The river Styx, I don't know whether that's its name, but I call it the river Styx, maybe it's right and maybe it's wrong. I suspect it's wrong,

MERZBACH:

[Laugh]

ATANASOFF:

but, it's got some other name, but I call it the river Styx. Well, it rose, and there, and they had the bottles in the basement there, and you know all Englishmen must be acquainted with wine, but here all the labels got washed off the bottles and it was a catastrophe.

MERZBACH:

Oh my [laugh].

ATANASOFF:

So all the Englishmen had to drink without knowing what they were drinking and their edification was not enhanced. And the plumbing was on the outside of the buildings: they couldn't put a 4-inch sewer pipe up inside the building, because there wasn't any room, the walls were thick and solid stone, so they put it up on the outside, and then annually it froze and with the consequent catastrophe thereof. Well.

BOTH:

[Laugh]

ATANASOFF:

Oh well, shucks. Well, I really loved statistics. This is my trouble, I love all of this stuff, and I love it intensely.

In 1929, in the spring, I went to the University of Wisconsin to further pursue graduate work. I'd had plenty of course work. I had formal courses. The real question was: Would the University of Wisconsin accept any of this graduate work from a second-rate institution like Iowa State University? And so they put me in. I entered late in the second semester. And they said, "Well, what can we do with a man who is coming in to do graduate work late in the second semester?" So they put me in a course in theory of elasticity, in which I'd previously done some work. But it was a very advanced and hard course in the theory of elasticity, under H. W. March. And they put me in a course in quantum mechanics, late in the second semester; and quantum mechanics was a new subject, it was a growing and fast and open field. So the question was, could I survive these? And, of course, if I survived, well, that was that. And the survival -- and along during that period, I also had to learn French. That spring I had to do those three things. Well, I expect I was the best student in both courses. And I passed French; and this pretty well set me up, and I got a degree alright.

MERZBACH:

Well, that was actually a very short period, right? You just had one year of residence?

ATANASOFF:

Well, I went there in the spring and that summer I took a course under van Vleck, J. H. van Vleck, do you know of him?

MERZBACH:

Oh yes.

ATANASOFF:

Well, J. H. van Vleck was the theoretician in physics and so I came directly under his tutelage. And I took a course in, oh, you know, magnetic and dielectric ferrous and magnetic susceptibility, a rather elaborate course and a very hard one. Very few students, and I was easily pretty well the best in that kind of stuff. because this was of intense interest to me. And then, you see, I went on and did a thesis in polarizability of helium, a theoretical calculation of the polarizability of helium. And the following year I had an instructorship there and I was able to support myself, I didn't have any work in the spring, but in the following year I had an instructorship there and was able to support myself. And I did a thesis. And so, at the end of the first summer session there, the following year, I got a Ph.D.

MERZBACH:

Now here again, on this thesis, how did you come to pick the topic?

ATANASOFF:

Well, you see, you know I told you, a long time ago I knew I was going into theoretical physics. And this was van Vleck and this was van Vleck's field of interest, very simple and straightforward in this case. Although I wasn't so far off in the previous case, and it wasn't nearly as clear cut a decision, but in this case the decision was very clear.

And I knew the only reason I hurt H. W. March's feelings by going into physics: He thought that physics was for newcomers who didn't have important things to do and he was an old and classical man in the theory of elasticity, and he was top-notch. Mathematical theory of elasticity, he was one of the best men who ever lived in the United States. And I had the advantage of his -- of contact with him. And I had the chore of attempting to convert him to tensor methods, which he had never touched in his life. And by this time I was commencing to realize the possibility of applying -- nobody knew this at that date -- but I was commencing to realize the possibility of applying vector and tensor methods to subjects like theory of elasticity, and it was nip and tuck, and he wasn't

at all sure that I wasn't crazy.

MERZBACH:

Was he willing to give it a try?

ATANASOFF:

Well yes, he was a fair-minded man. And, of course, it works. Of course today it's overwhelmingly the method of preference in these fields. But the world was a different place in those days.

And my granddaughter wants to go to the University of Wisconsin, and she's sixteen, and in a couple of weeks, why, she's going to visit a girlfriend who's attending the University of Wisconsin. And going up there and I told her where to go and where to stay and what to look for the other day; and she lives in Rockville.

MERZBACH:

Now, you did some teaching, and that was that second year that you were at Wisconsin?

ATANASOFF:

Yes. I went up in the spring, you see, in March or April, and then I finished out that year, and then I went during the summer, and all the time I was busy and had plenty to do. And by the time I got to working on a thesis, then the thesis work was pretty intense. And come fall, why, van Vleck left and went to Europe for a period, and his place was taken by Dr. Gregory Wentzel; and -- who still survives, I believe; and van Vleck is alive. Another member of our faculty there, who was rather well-known was Warren Weaver. And Warren Weaver stood up with me when I got a degree and Warren Weaver -- I'm derelict. I called his number four or five months ago, Secondhill, up in Connecticut somewhere, and his wife told me that he was in very, very bad shape and couldn't speak on the telephone and would I call back, and I haven't called back; and I'm afraid, he may be dead. He had serious heart defects and he was about on his way. She told me. I knew her; she told me; I hadn't had much to do with him in many years.

MERZBACH:

So then, of course this is anticipating a bit, but, of course, you did come into contact again with him?

ATANASOFF:

Oh yes, we have had relations in-between, yes we did.

MERZBACH:

Going back a little bit and getting away from your own work for a moment. You mentioned having listened to some of Fisher's lectures. Can you describe them?

ATANASOFF:

Yes. Well, he was going through working -- the theory of maximum likelihood was new to him then. He was trying it out in front of a class, and that's what the lectures were about; how one applies the theory of maximum likelihood to a variety of problems.

MERZBACH:

What kind of lecturer was he?

ATANASOFF:

As far as I'm concerned, perfectly adequate, perfectly adequate. He was not a smooth man. Fisher could not be regarded as a smooth man. And, of course, his theory of maximum likelihood was a brand new theory in -- you know, almost revolutionary in the theory of statistics; you know that. Now this more or less sums up what I remember about it. I haven't ever attempted to reconstruct any of this, maybe I could if I tried. But this is what comes to me right off the cuff.

MERZBACH:

What about van Vleck as a teacher? Now, you worked closely with him.

ATANASOFF:

Yes, I did. Almost impossibly poor lecturer. Expr-- but except for me, it didn't make much difference; as a matter of fact, I understood him, or I made a note and I understood him pretty quick after I thought it over or after I discussed it with him; it didn't make any difference. van Vleck.

MERZBACH:

How about his communication with his students?

ATANASOFF:

Oh, very, very poor; very, very poor, impossibly poor. Much worse than Fisher's, much worse than Gregory Wentzel, who couldn't speak English, worse than anybody's. He was, his father was an excellent -- do you know his father? van Vleck's father?

MERZBACH:

Well just—

ATANASOFF:

You know, an important mathematician.

MERZBACH:

Yes.

ATANASOFF:

Well, his father was a good lecturer and how van Vleck could be so poor, I don't know. You know, little J. H., and you know he didn't have any sympatico. Once upon a time I wanted to see him, and he was my major professor, he was going away to Europe, and I wanted to discuss my thesis with him. And I was angry as hell when he told me to come at the same time he told all the rest of his students to come. And I guess it showed on my face; and he said to me, "Oh, don't worry, they won't come." And not a one came.

MERZBACH:

[Laugh].

ATANASOFF:

Can you imagine having three or four classes and not a one came? They just all fought clear of him. I went into his class of quantum mechanics when I first got there, and he had twenty-five people, and it was an important subject and they all knew that it was important, and they were trying to learn it. And when it came up to examination, there were only four people there, all the rest of them signed off the course before the examination, as you could do without any dishonor at the University of Wisconsin; and all the rest of them signed off. And then he says -- you know, he'd insulted me all year, because he knew I didn't know a damn thing about it. He acted as if some of the rest of them did, and then the poor man was in this position. He said, "Atanasoff, I am dumbfounded." So I didn't know what had happened then. He says, "You gave me one of the three best papers in the class." And he says: "I'm afraid it was the best." And this was a direct insult to him, to think that a person who had entered late in the second semester of a course could turn out one of the three best papers, or maybe the best, after he had taught all the rest of them all the year. And they were a profound group. The present, you know the man who's being replaced down here, was a member of that class -- as head of the Science Foundation. What's his name?

MERZBACH:

The outgoing -- yes, I can't remember his name at the moment.

ATANASOFF:

Well, he was a member of that class at that time, and he didn't understand it either. And we'll get his name, I'll get his name for you, it's in *Science*.

MERZBACH:

I know his name. It'll come to me, too.

ATANASOFF:

Yes, he was a member of that class. I don't remember whether he was one of the ones who stayed and took the examination or whether he didn't, I'm not quite sure, but he didn't understand it well, I'm positive of that.

MERZBACH:

During the time, either as a student at Iowa or Wisconsin, did you have any involvement or thought concerning the need of computation?

ATANASOFF:

Well, you see, while I was in Iowa State University -- we should have mentioned that, I presume. You see, Iowa State College had IBM tabulator equipment there. And I had to understand this. And I commenced to study it and think about it a little bit.

MERZBACH:

Why did you have to understand this?

ATANASOFF:

Well, because this is [laugh] -- the reason for it, I figure, is --I don't know. This is just a pressure that grew within me and that was the directing force. In spite of all the other things -- Alice [Atanasoff], will you get a copy of that paper by Brandt and I? And I would talk to the repair men when they'd come by. And they didn't know much, but they'd tell me what they could. And nobody published any circuit diagrams for such a machine.

[Aside to Mrs. A.:] Do you know where that paper by Brandt and I would be? You'll know in a moment.

MERZBACH:

1935?

ATANASOFF:

Have you got a copy?

MERZBACH:

I've read it.

ATANASOFF:

You've read it.

ALICE ATANASOFF:

It's probably here, and I know there's one in back.

ATANASOFF:

All right, go back and get it. And this erupted during that period. And then I just -- Now you see—

MERZBACH:

Well now, this was actually after you came back, wasn't it?

ATANASOFF:

This actually was in '35, after I came back.

MERZBACH:

But first—

ATANASOFF:

But you see during this early period, I was working on this concept of the IBM tabulator and what it would do, and pretty quick I felt as if I understood it pretty well.

MERZBACH:

Did you have any specific thought as to what use you might be able to make of it?

ATANASOFF:

No. I knew how you could use it in statistics. But it was fairly clumsy in this application, as you know, and it wasn't working very well; I could see that plainly. I tell you, I also during this period took apart a Monroe. And so I clicked inside sometime in my early career -- well, let's see, I don't really know whether this was at the University of Florida or Iowa State College, during those periods I did take apart a Monroe and figured out exactly how it worked. And I also had read, by this time, you see, I'd read the *International Encyclopedia* and the *Encyclopedia Britannica* on the subject of computing machines, and this was just about all the art that was known. If you were pretty quick, you'd know it all. And even if you didn't know it, you could guess at what was done, because there weren't many things that could be done.

MERZBACH:

Did you talk to any of the people who were making use of the --?

ATANASOFF:

Oh, A. E. Brandt was my friend, you see; do you know A. E. Brandt?

MERZBACH:

I just know of him.

ATANASOFF:

Well, you see, I correspond with him a little bit, still. He's at Gainesville and retired. And he is 76 or 7 now and Brandt was a -- have you ever met him?

MERZBACH:

No.

ATANASOFF:

He is a slow-witted, friendly man. And he did everything he could for me. And such people are helpful along the way, you know, they're very important. And -- yes. And, well, we'll talk about that afterwards.

MERZBACH:

What about earlier, I mean, just about the time you came to Iowa I suppose, I gather that the work by Wallace and Snedecor had created quite a bit of --

ATANASOFF:

Well, yes, and Snedecor, you see, was there. And Snedecor is -- Snedecor -- he hadn't gotten anywhere yet with statistics, and he did get somewhere, and got a long ways. And he -- a man of very feeble mental character, very feeble. I mean I hardly know anybody of attainment in the academic world who wasn't better than Snedecor, hardly anybody. It wasn't any enmity, we were friends, we even lived near each other, but I never heard him say anything that was wise. He told me once, for instance -- I remember he'd utter new cases like this and I knew they were false; we were discussing the theory of probability and he says: "The theory of probability had nothing to do with statistics." Now is there any rationale that anybody's ever held, that corresponded with a statement of that kind, except Snedecor?

MERZBACH:

That's incredible.

ATANASOFF:

Yes. And he actually said exactly that. And I remember it as though it were yesterday. I don't know why I remember such truck. But, of course, that's fairly striking.

MERZBACH:

Yes, it is.

ATANASOFF:

He didn't know any theory of probability.

MERZBACH:

No. So, well --

ATANASOFF:

He had only the working --and you know that's another reason why Snedecor was successful, that you should know about, in passing, and it'll be of interest to you, you being sort of a mathematical historian; are you?

MERZBACH:

Yes, I consider that my first trade.

ATANASOFF:

Is that your field? Did you ever hear of Henry Wallace?

MERZBACH:

Yes.

ATANASOFF:

You know Wallace wrote a book on statistics with Snedecor?

MERZBACH:

Yes.

ATANASOFF:

And, well, you know who Henry Wallace is?

MERZBACH:

Yes.

ATANASOFF:

And afterwards Vice-President?

MERZBACH:

Yes.

ATANASOFF:

And afterwards pseudo-liberal and he died.

MERZBACH:

Ah. Well.

ATANASOFF:

Scion of a great family; his uncle was Secretary of Agriculture before him. And an extremely brilliant man who was able to conceive of hybrid corn. And absolutely brilliant. And he needed statistics, and so he went up there; and Snedecor didn't know

any, and he didn't know any, Snedecor hadn't worked in statistics, so they started working together and they wrote a book together. That's what happened and that's the way Snedecor got started in statistics, it was due to the agency of Henry Wallace, who never is considered a statistician at all, but who was a very brilliant man.

MERZBACH:

Now I gather that he was also responsible -- Wallace that is -- for really getting that IBM tabulating equipment into the statistics lab.

ATANASOFF:

Oh yes! Yes, that's right. Yes, he just, he just -- you see, he was a local man, and his family had newspaper influence, and he was wealthy and he just simply pushed Iowa State College and Snedecor along. And later, later I made a speech in Hyde Park in London about Wallace.

MERZBACH:

Yes?

ATANASOFF:

[Laugh]. Well, goodness sakes.

MERZBACH:

You started to talk about the paper you did, the work you did with Brandt.

ATANASOFF:

Well, I was going to wait until we came back now, just for a moment it slipped me. But, you see, I have all these things running through -- they don't run through in date form, they run through in subject form in my mind. And I'm likely to slip on a date. You reminded me that it was later, and I thought we'd cover this in the next era.

MERZBACH:

All right. Well then.

ATANASOFF:

I went to the University of Wisconsin, and it was a fine school and I tried to take advantage of it. Almost everything was in fine shape there, except the library, it wasn't nearly as good as Iowa State University's library. And I never have come into a library

which did me a tenth as much good as this library engineered by -- a man who nobody could get along with, but who turned out a perfect product, namely a perfect library, named Brown. Who was librarian at Brown, and Brown was librarian, and he was succeeded by a young man who was in my mathematics class when I first came to Iowa State College and now he's been succeeded by another man. He isn't old enough really to retire, but he was retired because he became an alcoholic and it's a sad story and he's my good friend. And now the man that's succeeded him, and now the library at the University is ready to take a nose-dive because he's just a stuffed shirt just like all the rest of the goddamn fools that occupy such position. Pardon me, it's awful.

MERZBACH:

[Chuckling]. Yes, it is.

ATANASOFF:

He's a stuffed shirt and I forget about the library as a friendly point of contact anymore. Any library is the same. I go in them and squeeze what use I can out of them and go out the door. And most of the librarians are there to oppose you. Not all of them, thank goodness. They gave me a stack permit at the Library of Congress once, some friendly soul down there did. And I had this library down at, down at the -- the best library near me now is the one at the Bureau of Standards; I don't get along with the librarian down there, but I don't have to, I just go down there and get the stuff and get out. I'm figuring out how to steal copies of all of the literature down there. See, there's no way of my getting it, so now I'm just figuring out some way of stealing it.

MERZBACH:

[Laugh].

ATANASOFF:

And then if they catch me, I don't mean that I'm going to go steal the books, I'm going to act as if I'm a member of the staff down there and I'm going to go in and get reproductions made and walk away with them. Because there's no other way of my getting reproductions that has any sense at all to it. And then, when I get caught at it, if I do, I'll just ask them to take me up to Astin, and then I'll tell Astin who I am and he'll say go your way. Or another possibility is, I can ask him for an appointment some way, some kind of a formal appointment so that I can do it. Maybe I'll do that instead. I don't care much. But I don't believe in having formalistic fiddle faddling fools getting in your way. And people say, "What is the difference? You can get it in two or three weeks." You can't do anything if you've got to wait two or three weeks every time you want anything! Because they forget that you've got to try twenty times before you get anything you really need, and if each one of these takes two or three weeks then you've lost a year.

MERZBACH:

It's arithmetic.

ATANASOFF:

It's simple arithmetic.

MERZBACH:

Let's see. Is there anything -- yes, there is one major event for that period.

ATANASOFF:

You've done pretty well.

MERZBACH:

You got married shortly after you arrived, am I right?

ATANASOFF:

Yes, I got married in '26.

MERZBACH:

And did you meet up there?

ATANASOFF:

Yes, I met at Iowa State University. That's a different wife you understand.

MERZBACH:

Yes, I understand. Well, I just thought we should get that in now.

ATANASOFF:

That was right. Good enough, good enough.

MERZBACH:

And then you had -- you also had one child?

ATANASOFF:

I had one child. Let's see now. I had three children. And one child by the time I went to Wisconsin,

MERZBACH:

Yes, I...

ATANASOFF:

another child after I got back, and then still a third. In 1935 I had a boy who is now an engineer for AVCO in Boston. Two girls and a boy. One girl, the oldest girl, is in Rockville, the next one is in Denver, she had just returned from seven years in the Orient, which ruined my grandchildren. Between Hippy-ism and the Orient complex, the Oriental complex –

MERZBACH:

Quite a combination.

ATANASOFF:

Why, it's hard on kids to survive such a combination. And the boys have this difficulty. I don't know, but I think he'll make it. He makes fine grades in school, there's no problem with that. There's just a plethora of brains, and they don't have to work very hard and it's kind of sinful. Because if they had to work, they'd stand almost a better chance of succeeding if they weren't so bright, if they learned to work, wouldn't they?

MERZBACH:

Well, that's difficult to argue about.

ATANASOFF:

You say "comme ci, comme ca."

MERZBACH:

Comme ci, comme ca. Alright, well, as I've said, I wanted to get that part in. Now I suppose we are ready to lead you back to Iowa?

ATANASOFF:

Well, I had held an instructorship at the University of Wisconsin during my last year there and I also taught during the summer that I was there. And then I was given an

assistant professorship back at Iowa State College. And I returned there. And, of course, I was given an assistant professorship in mathematics, in spite of the fact that I had majored in theoretical physics, the job I was given was in mathematics. And I was determined to reshape that situation there, because I knew that the mathematics was, the mathematics and physics departments were both ossified organizations, but I felt as if I had a better chance in physics than I had in mathematics. In the meanwhile, they tried to improve physics a little bit, and got two men in. Two men, new men, in. But I came back and, of course, studying and working, I remember the first year I was back I realized that I needed to know electronics, and I'd never you see, I had had almost no electronics in the university because it wasn't taught in those days. And so I gave myself a part of a year to learn electronics. And I learned it alright. I built three or four pieces of electronic equipment with my own hands. Studied the theory and studied van der Bijl, which is the first book of serious character in vacuum tube theory. B-I-J-L, I think. van der Bijl, do you know the book?

MERZBACH:

I haven't looked at it, I've heard of it.

ATANASOFF:

And I then got permission to offer a course in advanced dynamics. And I gave that course and pretty quick it was perfectly plain that I would be able to give courses in theoretical physics and I was -- well, about this time I was made a member of the staff of mathematics and physics. Now let's see, I don't know whether I've looked, whether I've been able to -- yeah: \$2000 a year and \$300 for summer teaching; that's exactly right.

MERZBACH:

That was at Wisconsin?

ATANASOFF:

Wisconsin.

MERZBACH:

Now what's this comment here about Boolean algebra?

ATANASOFF:

You know, you see the lawyers put that in.

MERZBACH:

[Laugh].

ATANASOFF:

I studied Boolean algebra, but not too seriously in this case. I understood what it was, and still do.

MERZBACH:

Well, how did you get hold of it? I mean, how did you study it?

ATANASOFF:

Why, I just got a book; I got Boole's book.

MERZBACH:

Oh, Boole; The Laws of Thought?

ATANASOFF:

Why sure!

MERZBACH:

Aha.

ATANASOFF:

I've got it here somewhere. And I got that and I commenced to study it. And somewhere I've got it here, but, of course, this isn't the same copy that I studied then. Yes, here it is. And, but you know they picked that up when I mentioned it, because those lawyers are pretty sharp. And I wouldn't say that Boole had any influence on my career in computing machines at all, that's the truth. At any rate, if it has any influence, it is an indirect one.

MERZBACH:

At least you weren't conscious—

ATANASOFF:

I knew, I knew that when I got at working at logical circuits that I was dealing with a new algebra. And in my writings, I can show you where in my writings I was aware of that, and I can show you the pages, some of the pages, principally doodling, that I did when these thoughts were going through my head. I ought to put in more time on those; but I

did it mostly by main strength and awkwardness, not as they do today with the application of Boolean algebra to square [?] logic circuits.

Now base 2, strangely enough, Mother had an arithmetic, I used to say it was Robinson's, but, no, I guess it was Robinson's *Arithmetic* -- we'll ask Mother again; Mother remembers exactly about that arithmetic, and I'll ask her. She had this arithmetic, and it was a very thick one, and you know, in the early days, that arithmetic included everything and it included bases other than two for number systems. There was a full chapter in that, and I read it during those early productive five years, and then went back to that and I have, never have understood it. You know this theory of casting out nines?

MERZBACH:

Yes.

ATANASOFF:

These, did you learn that somewhere along the way?

MERZBACH:

Somewhere, yes.

ATANASOFF:

Well, you know I learned such things as that from that book and I learned other bases. And then, all of a sudden, you know there's some propositional theory in the theory of real variables that it's easier to write up the proof in terms of base 2 than base 10? And then there's someplace here where there is a proposition, and I can't quote the proposition although I can doubtless dig it out, if I spend some time on it. And the proof of the proposition is more easily phrased in terms of base 2 numbers than base 10 numbers; and so Hobson, I was studying Hobson, it's in Hobson, all you'd have to do is pull Hobson and you'll find that spot. And -- E. W. Hobson *Theory of Real Variables*. Now, and, of course, that caused me to snap back over those years, and I had it in my hand immediately and fully and happily. And so I had base 2 numbers in my mind very sharply.

MERZBACH:

Did you do any specific reading in mathematical logic, say other than Boole's book?

ATANASOFF:

Only such things as, you know, I studied -- well, that isn't quite right. I studied Russell in Whitehead & Russell. Always on my own, always on my own.

MERZBACH:

Aha.

ATANASOFF:

Always on my own.

MERZBACH:

But you did,

ATANASOFF:

Yes.

MERZBACH:

When was -- was this during --

ATANASOFF:

I think it was largely before I went to Wisconsin,

MERZBACH:

I see.

ATANASOFF:

largely before I went to Wisconsin, that means before 1929--between the years, between '25 and '29. Now it might have also, some of that might have fallen after I returned. But after I returned, pretty quickly I was extremely busy, you know, and in two or three years I had graduate courses and graduate students. And then your chance to play around is much reduced; you know the consequence of that.

MERZBACH:

Did you do any reading in Hilbert?

ATANASOFF:

In what?

MERZBACH:

Hilbert.

ATANASOFF:

Oh, Courant and Hilbert? Hilbert spaces?

MERZBACH:

Either the geometry or logic or Courant & Hilbert.

ATANASOFF:

I did Courant & Hilbert, of course. Yes, I did Courant & Hilbert. Let's see, now I have that Courant & Hilbert here which came from those days, and I might, sometimes I write in a book when I buy a book; this is my own copy from the day when I first studied Courant & Hilbert and it's been rebound. And there's my signature. I always plan -- but sometimes I didn't do it, and in this case I guess I didn't -- to write in the back the date I received it. I remember that I, some of these books, some of these books I know I did that. And these are books by Max Planck;

MERZBACH:

Oh yes.

ATANASOFF:

in the original German. Now I know I have here -- I just happened to remember that I've seen that.

MERZBACH:

Yes. [Reading:] 1928.

ATANASOFF:

See, I notice I ordered this directly from Germany, and then I'd buy them from Steckert. Do you know, is Steckert still in existence?

MERZBACH:

Oh yes, very much so.

ATANASOFF:

And you see, sometimes from Steckert and sometimes from the publisher and they cost me a dollar and forty cents apiece. Those are my friends; and Planck was friend. I never saw him; and I should have. I had a chance to see him. He was in bad health, but the people who knew said he'd receive me if I would send him a note and tell him why I wanted to see him. And this was after the War, and his son had been killed by the Nazis, you know?

MERZBACH:

Yes.

ATANASOFF:

And something intervened, and I didn't do it. I could have forced it, because I was in Germany and I could have insisted on going there and then I would have gone. And I should have done it, because the man deserved what little adulation I could bring to his graveside. And it would have been sincere enough on my part; of course, he must have had a large group of admiring students in Germany there in these years.

MERZBACH:

In your reading in those days, in the encyclopedias, for example, on computing machinery, do you recall any particular developments that struck you?

ATANASOFF:

Of course, Babbage.

MERZBACH:

Babbage.

ATANASOFF:

And you know, Babbage has a very important place in the history of computing machines, you know that. And, I think, not much else, there's nothing. There's nothing, really nothing. You know the innovations in computing machines -- the world was ready for innovations in computing machines, but they had not occurred at that time. You realize that. Of course, I didn't realize that, but you do now in retrospect; yes. And I think that, oh, the time was so ripe, you know, no man influences the world much; you know that. The world. I probably got the ideas only just years ahead of other people, that's all. Just years; not a decade. It was bound to come.

MERZBACH:

What about some of the earlier -- say, Pascal, Leibniz -- did that make any particular impressions?

ATANASOFF:

Yes, yes! You know that I -- all of those people had an influence. You know, you can't, you know a man is a weak thing, a man's mind is a weak thing, and as soon as you realize it -- you can be cocky about your mind, but if you've got any sense at all, you know what its weaknesses are. And I can horrify you with the lacuna on my mind; I can horrify myself, and it disturbs me. I don't, you don't do things like that, not necessarily, but these people all have an influence. And, you see, then I had returned from the University of Wisconsin, and I was looking for new fields to conquer. Have you got Gross's thesis?

MERZBACH:

No.

ATANASOFF:

You should have Gross's thesis. Now you can perhaps get that to best advantage through the Iowa State College Library. I'll give you the names of all of my students and you can draw 'em, because these will tell you something about my thinking during that period. Or I can get some of this material together for you.

You see, I was impressed with the needs of the applications and what part of mathematics, how mathematics should bend itself to furnish some answer to these needs. And these thoughts commenced to grow heavily upon me and it just wasn't merely computing machines. You know, I have been a kind of a hybrid individual all my life, you'll catch sense of this; the mathematician was scarcely on me, nor the physicist either, you know what I mean. I was roving between the two fields. And sometimes I remember, I remember once I went into seismology for a matter of two or three years. And I've done this kind of thing all my life, and built thirty or forty seismographs. And right at the moment, you know the things that I do, I think they're mostly mundane things, because mundane things that other people don't think about and I love to think about, these things are important to me.

It'll interest you to know that right at the moment I am examining the theory of weighing machines. The theory of weighing machines in a very, very basic way, and what agencies -- and this is a subject that's very far advanced, and independently, and I didn't have anything to do with it. And all of a sudden I decided that I would examine in a great deal more detail than has ever been done before the theory of weighing machines and the factors which permit you to do well in this field. And I imagine, for the last 2 or 3 days my study has been on the theory of elastic numbers in weighing machines. And this was what I was working on this morning before you got here. And that's where the differential

equation was, that I kind of slipped on, and it happened to have a solution which was a hyperbolic sine and it had a hyperbolic sine for a solution, so that was rudimentary. It's a rudimentary equation, on the whole, I'm doing pretty well yet. I suppose I can, maybe sometimes I fancy I can detect a slowing down on my acumen. On the other hand, sometimes it seems to me that I have more judgment and power than I did before. But you know, on the other hand, that the kids are doing everything important. You know that and I know that. The kids are doing everything important. But I've got to keep trying. I've got this friend, Dr. William G. Cady, do you know anything about William G. Cady?

MERZBACH:

C-a-d-y, right?

ATANASOFF:

C-a-d-y.

MERZBACH:

Yes, well, just—

ATANASOFF:

Now he is a very good friend of mine, and I saw him up -- he lives next door to Brown University. And he taught at Wesleyan until he retired, and then he had a son who is in -- who worked for -- oh, whatever China Lake -- what does China Lake mean to you? Do you know what --

MERZBACH:

Yes, The Naval --

ATANASOFF:

Organization. Well, he worked for them, except at Pasadena, his son did, and then his son got an embolism and died, and then Cady at the age of 65 took over and educated his son's children. And he's brilliant and able to do it. But Cady, he's a very brilliant man, he's written the best book on piezoelectricity ever published in the United States without any qualification; and where else in the world is a good one published? You have to go back to the original discussions of crystals, of elastic theory of crystals by a German, and I ought to know that it's so familiar to me, and I can't pull it out at this second.

But Cady and I both worked on piezoelectric crystals, as a matter of fact, and that's the reason I came to know him, as a matter of fact, and those are some of the papers of me and my students during this period that you're going to inquire about. And Cady knew I

was a lonesome, scared guy, and he took me in his hand and helped me as much as he could, and having the eminence of the position he used to do me a great deal of good, and gave me courage and confidence, and I was able to go ahead. And, I don't know, you haven't noticed it in me, but you see, during those days the people from the mid-West were over-awed by people in the East and this was a dominant factor; and the academic world is full of this, full of this sort of stuff and the propositions and the standing, and the professional standing, and whatever. You know it makes it hard for a young man to come along and get ahead. He doesn't have any trouble if he's nurtured by a first-class man in the East; during those days he didn't. But if he wasn't, then he had a harder time. Well, Cady gave me some of this assistance that I needed; and so he's my friend. And he's now 93 and he's still writing. And he lives up at Providence, is that where Brown University is?

MERZBACH:

Yes.

ATANASOFF:

And I went by and visited him, and he gave me a paper that he wrote last year, in mathematics. His claim to fame is that he was the first man to stabilize the frequency of a radio signal by means of piezoelectric crystals. It should have made him a multi-millionaire; and got five thousand dollars for the entire thing. Well, he educated his grandchildren, and then he was left out there and he only had his daughter-in-law; and the grandchildren scattered to the winds and so he came back here. And then he said, "I moved into the house that I was born." And I visited there. And he had two brothers; all of them were above ninety living there, one of them had died before I got up to see him.

MERZBACH:

Hm. Just wrapping up this early -- When did you first hear of some of the analog machinery in use?

ATANASOFF:

The what?

MERZBACH:

Some of the major analog machine developments. Well, the Bush machines.

ATANASOFF:

Oh, you understand that pretty quickly the literature was full of the Bush analyzer.

MERZBACH:

Yes.

ATANASOFF:

Now the literature, you know. Nobody around Iowa State College was building one, or anything like that; but you would read about it and here about it. And, of course, it was easy for me to understand it. And I did so, and in a few hours' reading, I understood pretty much how the thing clicked.

MERZBACH:

Had you had any prior experience with the simple integrating mechanisms, the planimeters?

ATANASOFF:

Yes, yes. Let's see now; I believe I can show you where my first contact with planimeters was. Now it's got to be here, I believe; I haven't looked at it in fifty years.

MERZBACH:

Really? Yes?

ATANASOFF:

Yes. But it's got to be in here, let's see if it is. I haven't looked at it in fifty years, I will tell you; more than that probably. I had had contact with planimeters -- [reading:] "Polar planimeter, 172, 173 " -- and during those five years I had studied this. [Leafing through a book]. Yes: Here it is, just as it was; and this theory I studied. In those years, when I was a kid before I went to Mulbury, before I was fifteen, I studied this theory right here. And, you know, I hadn't looked at it and so I was in Mexico City about ten years ago, and I went by, I always go by the National Pawnshop when I am in Mexico City, so I went by the Pawnshop and I bought this planimeter, which I'll show you in a minute. I'll show it to you now. And so I took it back to my apartment and I said, "Oh yes, you know, you studied the theory of planimeters once." So, before I went to sleep, I worked out the mathematical theory of planimeters, and I knew it wasn't the same theory as given here, because I used methods of differential and integral calculus, which were not -- A person here was supposed to get it without use of such agency. So I knew it wasn't the same theory, but I worked it out and the next day I saw a Mexican friend of mine, who is a very intelligent man, who never went to college, but studied calculus by himself. And I was showing him the planimeter and he says, "Do you know how it works?" and I showed him the theory, and so he copied it all down laboriously.

MERZBACH:

Ah –

ATANASOFF:

And this Mexican, he's -- you know what happens, you see, you go around and you'll have letters of introduction and this way you'll contact all the stuffed shirts. But sometimes you'll go around the slums and you'll contact somebody better. But this time I was in a photo shop, and I was having trouble making my wants known -- in a Spanish-speaking photo shop -- and he came over and, in very poor English, said, "I will help you," and he did. And then I said, "Let's have a cup of coffee." And by the time I finished drinking the cup of coffee, I says "Here's my friend for life." And he's visited me here at this house three times.

MERZBACH:

He has?

ATANASOFF:

And he made himself a millionaire. I didn't know any of this, he looked like a rough man, he made himself a millionaire by building apartment buildings in Mexico City. Now he has, in the last two years, he told me that he has made three million dollars making tax rolls for the City of Guadalajara in the state of Huevco [?] whatever it is. In Mexico; it's the second largest city. He formed a company, Aerial Surveying Ground Operating Company, whose object is, and specialty is, making out tax rolls. And taxes have gotten so bad in Mexico, they cut the tax rate to one quarter and increased the amount of taxes they collected three-fold, simultaneously; now if you can understand that! They cut the tax rate to one quarter and increased the taxes they received three-fold, and his company is famous and he's even been called to operate in the United States. And his son is going to Canada, he doesn't think he should come to the United States, he's going to Canada to a French-speaking University in Canada, Montreal – Quebec, Quebec. And this Mexican that I know is of pure French blood, but his son is part Mexican and part German. His wife is German-speaking; her father was pure German. And the boy has promised me faithfully that when he can't go home to Mexico he'll come down and see me, at Christmastime and the like. And he is fifteen and he's as brilliant as he can be! That boy is just as brilliant as they can be. And he works on science, the only kid that's coming along that works on science with some kind of approximation of the dedication that I did in those years, you know, and this kid's doing it. And his father provides every single help that he can think of to further this. Of course, his daughters, he just expects them to get married, but his sons, he's determined -- well, this son -- he has two sons, and this son -- the other son is a bright boy, but he's nothing like as bright as this one. And this young, Henri [?], well, he's going to get somewhere. And his father doesn't think the University of Mexico is anywhere nearly good enough for that son to go. He thinks maybe the other

son will go to the technical school in Mexico, but.

MERZBACH:

Well getting back to –

ATANASOFF:

Yes, [chuckle] let's do.

MERZBACH:

Well, in other words, you had worked out the theory when you were still a child. And then, did you ever have any practical experience with them?

ATANASOFF:

None at all. None at all. I mean, hardly any, I probably saw one in an office sometime. But, you see, I and all computation was commencing to -- it wasn't only the differential analyzer of Bush, but, you know, they had some analyzers for electrical circuits

MERZBACH:

Right.

ATANASOFF:

called setup boards, which were analog machines, really. I never worked with any of those, but I was aware of their existence, you see. And I was aware of what you could do with analog machines.

MERZBACH:

Generally, did any of your associates make use of the, you know, the various network analyzers and things like that?

ATANASOFF:

My students?

MERZBACH:

Or your associates at Iowa.

ATANASOFF:

Well, you see, after I returned, well then, I was in mathematics and physics, and I wasn't in direct contact I was in contact with, but not direct contact with electrical engineering. And, oh goodness, I didn't have any impulse in that direction. Do you know about Hannum's thesis, do you?

MERZBACH:

Hannum?

ATANASOFF:

Hannum, Lynn Hannum.

MERZBACH:

Now which is that?

ATANASOFF:

Well, one of my students did a thesis on an analog Laplaciometer.

MERZBACH:

Yes. Yes, yes.

ATANASOFF:

You know about that somehow, don't you?

MERZBACH:

Yes. Yes, that's right. I'd forgotten.

ATANASOFF:

Lynn Hannum followed me to Frederick off and on, followed me to Frederick, and I had this company going in Frederick. And then he, he -- a funny guy, a very funny guy, and he collapsed and left his family here and went away. And he's, I guess, in California now, I haven't heard of him in some years. But Lynn Hannum did this work on -- well, he and I together, you know how graduate students and professors work; sometimes the graduate student does more and sometimes he does less, but that's the way it was.

MERZBACH:

I think it might be a good –

ATANASOFF:

a quitting place? All right, good enough.

MERZBACH:

A break.

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