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*National Museum of American History*  
*Lemelson Center for the Study of Invention and Innovation*

## Computer Oral History Collection, 1969-1973, 1977

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**Interviewee:** John V. Atanasoff (1903-1995)

**Interviewer:** H. Tropp

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**Repository:** Archives Center, National Museum of American History

**TROPP:**

7th of June 1972 - continuation of my discussions with Dr. J. V. Atanasoff. And today we're holding our conversation in the West Conference Room of the Museum of History and Technology at the Smithsonian.

**ATANASOFF:**

And now...

**TROPP:**

Uh, before you start, I just want to indicate on this tape for identification purposes that we had been discussing your interest in alphabets, and we are going to pursue it, and one of these days we may even get around to doing a tape on this particular subject, but for today's session we're going to force ourselves to talk about Clifford Berry.

**ATANASOFF:**

Right. Now this is not well prepared or anything I want to point out, and I'm going to modify it as necessary in the future. But I want to talk about Clifford Berry because Clifford Berry was a very important factor - person in the - my work on computing machines. And he had - and in a - although he came to me as a very young man, he'd just finished a degree in electrical engineering, he was regarded by the staff of electrical engineering as one of the brightest, but not the brightest boy in his graduating class. And he had an innate genius in solving problems and organizing our programs that served me highly. And I have a very warm place in my heart for Clifford Berry. And I'm sorry that his end came the way it did...

**TROPP:**

You started to tell a story.

**ATANASOFF:**

As I look back on Clifford Berry's life I would have said if something unreasonable is going to happen to anybody, it would happen to me and not to Clifford. That's how

fondly I remember him, and that's how much confidence I had in his future as he worked for me. Even as a very young man he was reasonable, rational, he was systematic in his personal efforts, very careful in his personal habits, and carried no, as far as I could see, no germ of instability or anything of that kind. And I had this very careful, thoughtful feeling that he would succeed very well. Now we're going to see as the story progresses that, as a matter of fact, he did succeed very well, but some way the road turned and he came to a very disagreeable and sad end, and all the fact of his end I cannot reproduce here. I will reproduce what I can and add additional material later. And then we come to the dark places where I'm incapable of furnishing any help..

**TROPP:**

And I would gather that nobody ever will, either. I think too much time has elapsed.

**ATANASOFF:**

That's true

**TROPP:**

When you first met Clifford Berry he had already completed an electrical engineering degree, was it at Iowa State"

**ATANASOFF:**

No, he hadn't quite. It was a couple of months before he got his degree when I met him. And I needed somebody to work with me on my machine, and I looked around the Physics Department to see if there was anybody coming along with a major in Physics that would be interested in that. And at that time there was no one who looked as if he would be a potential for this work on computing machines. And I talked with Mr. - with Dr. Harold Anderson, then Professor of Electrical Engineering at Iowa State College, and Dr. Anderson recommended Clifford. And I left word with Anderson that I had a project which Clifford might be interested in. Harold Anderson knew something about my project. And I had - when he recommended Clifford I was immediately interested because I have this close relationship with Harold Anderson which I've maintained for some years. Previous to that time in which I maintained up to very modern day, Harold Anderson moved into Washington, too, and he worked in Washington part of the time for me at interim, and he was working at the - at the Naval Research Laboratory when he suddenly died at the age, of perhaps 66. Well, he sent Clifford Berry over to visit with me and I was enamored with Clifford at the first session. And I was very happy because I knew that my project was going to move ahead with Clifford. I don't know why, I just felt very eager to have Clifford go to work on the project, and very certain that it would be in good hands if Clifford and I worked on it together. And nothing that happened in the future led me to any other conclusion.

**TROPP:**

Was Clifford Berry working for an electrical concern during the time he was going to school, or was this done later, simultaneously, when he worked with you?

**ATANASOFF:**

No, he took a job - I finally arranged for stipend for Clifford - it was a very modest one, but I arranged for a stipend so commenced work doing graduate work, and working on my computing machine. The only duties he would have to the University would be to work on my computing machine, so the rest of this time, which wasn't much because he worked on my computing machine night and day, not that I was driving him hard on the subject, but he was very interested and eager on the subject himself, and he would have - he would have some money to keep himself up. As a matter of fact his mother lived in Ames, and so he was staying at home so that the money he had - his father was dead at the time. He had a sister and a brother, I believe. I believe he had a sister and a brother - I think - I have never met either one of them. I knew his mother, though.

**TROPP:**

I she still alive?

**ATANASOFF:**

She's still alive and living in Ames. And his mother - they were people who were poor citizens of the state of Iowa, and there's nothing extraordinary about them. But nevertheless I could detect a sign of sanity in Clifford, and the signs of genius were there. And I was eager for Clifford to go to work for me. I started a moment ago to tell you that I couldn't furnish him any money - the \_\_\_\_\_ of the university were such that I couldn't furnish him any money during the summer, and he took a temporary job during the summer with somebody. However, we got together from time to time during the summer and talked about the computing machine. I had worked out at the time that Clifford came there I think that my history would show you about where the machine stood. This was in the summer of 1939 that Clifford was joining my - I mean the fall of 1939 that Clifford was joining my staff

**TROPP:**

Was he, at the same time then, enrolling in a Master's Degree Program in Electrical Engineering?

**ATANASOFF:**

Now, he didn't enroll until the fall...

**TROPP:**

Until the fall?

**ATANASOFF:**

He worked - he worked with this company in Ames during the summer to get - he felt as if he had to earn a little money to make some contribution to the family's - to the family. And then in the fall he commenced working for me. Clifford Berry and I had several sessions during the spring and summer - perhaps a half a dozen in all. And Clifford rapidly caught on to what the thing was all about, and he immediately knew that was , as far as he was concerned he was going to work on it and work on it very hard. And at the time that Clifford came in I had had this period since the winter of '37-38 that I went to Illinois - I drove one night to Illinois and had the basic conception, and in the interim between the spring of '38 and the spring of '39 a year had elapsed - a full year and a few months had elapsed. And during that time I'd worked out the black box that was going to be the logic element in the system, worked out a preliminary design for such a black box, and I had made the arrangements - but I'd worked out a good many other details for the machine.

**TROPP:**

Now, as I recall our earlier conversations, you had, in a sense, worked out the overall logical architectural characteristics of the machine?

**ATANASOFF:**

Well, I had worked...

**TROPP:**

...the diodes and the memory drum, and the logical elements...

**ATANASOFF:**

Yes, I had - I knew what kind of a memory I was going to use, and I knew what kind of a logic system I was going to use, and I worked out some elements in the control and the method of working with the machine. You must remember that in a sense I didn't work out some of these things. Some of these things I just grafted on from - for instance the way that the machine was going to solve systems of equations I had merely extracted from the systems which were used to solve systems of equations by the manual method. And I had worked out the fact that the operation of the machine would be - as a matter of fact it came in my original inspiration regarding the machine that the machine would do numerical work in sequence, not quite like the computing machines as I knew them in that day. That is in which you - if you were adding two numbers, the numbers would be

numerically added but the carries would be identified and then added in at a later portion, but the - but what I mean by this sequential work - the machine was going to do the sequential logic roughly in the same sequence that a man mentally would do that logic - adding the two numbers and the carryover simultaneously and then carrying that over to the next column and adding those numbers, and so forth. And that's the way the numerical processes would be carried out. I planned that this machine would carry them out that way, and that was when part of the elements..... I planned that this machine would carry them out that way, and that was when part of the elements ..... I planned that the memory would have regeneration in it. But here is Clifford - so here is Clifford. In the fall of 1939 - and Clifford's understanding was so good that we will just repeat history, now, and say that, although Clifford came to work in September, that by the end of the year we had a prototype, a demonstration of a prototype doing calculations in this way, according to the methods which I had previously conceived. Clifford Berry was a good mechanic, which was an essential part of the thing. He could do electronic works freely with his hands, but his technique was equally as good as his digital manipulation - manual manipulation. He was very orderly. So I had no problem. Clifford Berry and I would sit out and we'd talk about how we might do things, so then Clifford would do them and there wasn't any need of any drawings, any large amount of drawings, or special designs. Things just went together rapidly in his hands.

**TROPP:**

In a sense the two of you really worked together - it really wasn't the typical case with the professor saying, "Here's what I want, now you go ahead and do it."

**ATANASOFF:**

You know, the machine would never have gotten in the position it was without Clifford Berry's \_\_\_\_\_. That's perfectly clear. And I...

**TROPP:**

You had the conceptual ideas but in terms of making it go the two of you were working, really, on all elements - the power, the circuitry...

**ATANASOFF:**

The machine succeeded rapidly because Clifford Berry had this ease in working with materials. It's true that I had an easy working flexibility in working with materials, too. This meant that Clifford Berry and I almost never were faulting each other. It was a very smooth, easy, systematic cooperation. I never had such cooperation with a man. Now this wasn't because Clifford Berry wasn't highly opinionated, he was. He had his own independent thoughts, and you will find that some things that I did that he objected to very strongly. One - he never liked - you know I'd gotten into this business of using

words differently in the construction of the machine. You will find in my original manuscript words so used, and one of them I remember that he objected to strongly was abacus. For some reason that work irritated him. And so when he later wrote material on the computing machine, he left out the word abacus, entirely. And I admonished him about it, but I wouldn't put enough pressure to cause him to change, because our relation was so good.

**TROPP:**

What did he use...

**ATANASOFF:**

He used counters. He went back to counters and neither one are quite good demonstrations of memory. Abacus is a memory, and a counter is a memory but neither one exactly duplicates modern concepts of memory.

**TROPP:**

Conceptually, did you feel in terms of the prototype that he contributed something - that he contributed things...

**ATANASOFF:**

Now you know - you know I soon saw that his contributions were so important that I drew a patent contract with him, according to which we would go on and do the corporation, and any rights or things of value which would eventuate from the work would be shared between myself and Clifford. Since the original conceptions were mine his share would only be 10%, but I calculated that he would receive 10% of what I received in any event. And this is at a time when he had no patents to his credit whatever, or had...

**TROPP:**

How old was Clifford Berry in that '39 period?

**ATANASOFF:**

We're going to have - we're going to have to do references to get this, but I would say that Clifford Berry at the time that he was working on the machine was roughly the age of 21.

**TROPP:**

So that he had essentially gone from High School to the University, got a degree, and was not the conventional age of a graduate student?

**ATANASOFF:**

Yes, he was. He was relatively early for a graduate student.

**TROPP:**

You were starting to tell me a story about Clifford at the very beginning, and I wondered if you can remember what that story was.

**ATANASOFF:**

I don't seem to react to it now. Doubtless we'll pick it up in the course of this discussion. I...

**TROPP:**

In terms of Clifford Berry's personal life, which seems to have some very - in terms of the...

**ATANASOFF:**

Clifford, as far as I could tell in connection with his personal life at the time he came with me he hadn't had much relations with women. He - I don't think he was having dates with any girls in the early part of his relations with me, and this led to a series of circumstances which - which I recall with something less than complete satisfaction.

**TROPP:**

You're speaking of his later marriage and relationship with your secretary?

**ATANASOFF:**

Yes, I am. Now, along came a young lady who had a slight limp which I believe was due to polio, and one leg was slightly shorter than the other - a slight limp, a nice girl, and she became my secretary at a certain stage of this enterprise. Now I believe she could have become my secretary - I had other secretaries, there, and I don't believe she could have come - become my secretary until the middle of 1940 or '41.

**TROPP:**

What was her name, do you remember?

**ATANASOFF:**

What?

**TROPP:**

What was her name, do you remember?

**ATANASOFF:**

Reid, R\_E\_I\_D, I believe. And her mother was a - had possessed some elected office in the county of Frederick. And her father was dead, so she had that in common. She only had a mother - in common with Clifford - she only had a mother. And...

**TROPP:**

When you said County office in Frederick, you mean in...

**ATANASOFF:**

I mean - I'm sorry, I don't mean in Frederick - I mean Sturrrick(?) County, Iowa. She had some kind of elected office in the county where Ames was located - Sturrrick County, Iowa. I don't know, she might have been County Treasurer - she might have been County Assessor, or some similar office that she possessed at that time. And I knew her mother very slightly. Jean was a - I suppose that we ought to treat these matters - this story of Clifford Berry, if I'm going to be very frank about it and that since it - even I was troubled about this part of Clifford Berry's history at a very early date. Now, should we write two histories of Clifford Berry, one for publication, or should we put...

**TROPP:**

No, I think we - I think we ought to do a candid, open one which we will not make public...

**ATANASOFF:**

For the time being.

**TROPP:**

,,but from which we can excerpt what is reasonable to use in...

**ATANASOFF:**

You know, it's a very strange thing. I had a number of secretaries who were satisfactory, but they were married women and my approach to my secretaries - I was - I had had an awful lot on my hands by the time that 19 - during the summer of 1940, or the summer of

1941 came along. I don't remember which it was. We can try to reconstruct that date in various ways. But the time that Jean Reid came to work for me, she was a - she hadn't been working for me very long. She was a very capable secretary, and did her work well, but some way when it turned out that Clifford Berry and she were going together, and in deep love, why, I was perturbed. I was deeply perturbed. There was something about - about the girl that I didn't want Clifford Berry to get involved with. It's a little hard in memory to tell you what this was. I found Jean to have an aggressive character, and goodness knows an aggressive character, alone, isn't sufficient for a person to have disturbance about. I wish that we didn't have to go through with that, and yet I never said one word, and they proceeded to get married in the summer of 1942. I was at the wedding, and kissed the bride, and the wedding was held in a flower garden close to the Physics Building at Iowa State College. And I sought mainly - I wished mainly for some natural intervention of providence in this courtship and marriage. There was none, and I would not raise a finger in spite of my apprehension, and my apprehension has existed from that day. Now...

**TROPP:**

Let's go back to Clifford Berry, then, He worked with you and the prototype, and essentially wrote his Master's Thesis on...

**ATANASOFF:**

Under my ...

**TROPP:**

...under your direction, on aspect of the prototype ...

**ATANASOFF:**

On one aspect of the main machine.

**TROPP:**

Oh, the main machine...

**ATANASOFF:**

Not the prototype - the main machine...

**TROPP:**

Right. I'm sorry.

**ATANASOFF:**

The prototype was just for the purpose we called that the prototype - it's just our terminology. You'll have to stick with it. We had a prototype which was mere working knowledge - working model to demonstrate the arithmetic and the computing capacity of elements of this type. And that was what was done in the fall of 1939. And then we had the think that I now call the Atanasoff-Berry computer. I didn't call it that at that time, but I'm inclined, since Clifford did the major part of the work on it, and a major part of the organization, and a major part of the conception as far as the later elements go - I am inclined, and since Clifford Berry is dead, I am inclined to dignify that by the name Atanasoff-Berry Computer. And I hope that it will go down in history in that way. I - Clifford Berry was there working on the machine from the fall of 1930, during the year 1939-40, 40-41, and 41-42 until the summer of '42. So he really worked on the computing machine for three successive years.

**TROPP:**

And he took his Master's Degree in...

**ATANASOFF:**

In the...

**TROPP:**

...spring of '42?

**ATANASOFF:**

I believe in the summer of '40 - I believe in the summer of '42 that he took his Master's Degree - or in the spring of '42. I'll have to verify that.

**TROPP:**

Yes, that we can check.

**ATANASOFF:**

We have his - you have a copy of his thesis...

**TROPP:**

Right.

**ATANASOFF:**

...in the file and on the \_\_\_\_\_ of that it will tell you what date it was, and I know it was during the summer, so there'll be no question as to...

**TROPP:**

Now the - at the end of that period of time, then, the big machine was completed as we've seen it in the photograph...

**ATANASOFF:**

That's right.

**TROPP:**

With the two memory drums, the drive shaft, the logical units, the power unit, and the main thing that Clifford was apparently working on, which was the decimal to binary input...

**ATANASOFF:**

No, the principle thing that Clifford Berry was working on was an input-output device which was to be employed for that machine in a way similar to what magnetic cores are used today, and it's called the slow memory. He was building a device for the slow memory, which you know is those base two card system. Now the base two card system, you will remember, the - it was a conception, and it was a conception of mind which Clifford was attempting to work out, and which was partially worked out. It wasn't completely worked out - which amounts to the - to an unproven element of the total - of the main machine. It's unproven in the sense that even at this day I don't know whether it can be made to work perfectly. I will describe this element, now, because we had no fast elements available at that time for recording. And it's clear that the punch cards would not record numbers in a volume and with the rapidity which is necessary to make this machine effective. And so I decided that I would use sheets of dielectric, probably paper of some kind - probably treated paper of some kind. And these are cards - punch cards I called them, but they were punched by \_\_\_\_\_ the dielectric spark - electric spark was punched through the dielectric, and when the electric spark was punched through then it left a carbonized hole, and this carbonized hold was detected. Now these devices were used with a moderate amount of success in this machine, but we would get them to work, and then they wouldn't work, and it was a question of finding the material that should be used in the paper and then we found a piece of material that worked 100%, and then we couldn't find the - locate the source of that - of that material. It's a very troublesome - very troublesome kind of a picture. There's no question - there's no personal question in my mind at the present moment that ultimately that device could have been made to work perfectly but it never was made to work perfectly because even though it worked perfectly on one sheet of paper, it was a very special sheet of paper and

we couldn't find the source from whence that piece of paper came, and we kept parts of it around and we intended to have it analyzed, and this is something that just never got quite finished.

**TROPP:**

Well then, by the summer of 1942 the state of the big machine as we know in the photographs was completed, Clifford Berry had his Master's Degree, the World War II had broken out six or seven months prior to this, and then Clifford Berry, as you mentioned, was faced with the problem of...

**ATANASOFF:**

The draft.

**TROPP:**

...the draft or a ...

**ATANASOFF:**

The draft was breathing down his neck. And the - I attempted to explain to his draft board he was working on a very important computing machine. This wasn't tied in close enough in the concepts of the Draft Board, and I didn't have the power to tie it in closely enough. I tried that - to keep the matter going, and so Clifford was going to be drafted. I had a classified project going which Clifford could join - which would have permitted him draft deferment because we could use the magic words there. We contemplated doing this - we planned to do this, and just at that time Clifford Berry got an attractive offer from a corporation in Pasadena, California. The man who caused him to get this offer visited me last week at Frederick. He was a friend of Clifford's who had been around when we were working on the machine, and gone off to Pasadena and had a job with this company. And he recommended Clifford as an employee of the company, and he received this attractive offer, Clifford Berry feeling the responsibilities of marriage, felt that he should go into the permanence of this work, and thus it became - it came about that Clifford Berry left the project in the - towards the end of the summer of 1942.

**TROPP:**

And this really, for all practical purposes, as we look at it now thirty years later, was when the project - the attempt to build what we call the big machine...

**ATANASOFF:**

The Atanasoff-Berry...

**TROPP:**

...at this point that you got involved...

**ATANASOFF:**

He didn't - nobody else - other people - there was another man appointed to this device - to work on this device, but he was a long way behind Clifford in ability. And it seems to me his name was Purcell...

**TROPP:**

Frissell -F-R-I-S-...

**ATANASOFF:**

...S-S-E-L-L or S-E-L, or something like that. Now - however, there were many disrupting factors at this time in view of the war. And pretty soon it became evident that the other project - about this time it became evident that the other project had fulfilled it's destiny and was no longer needed in its form, there.

**TROPP:**

You're talking about the classified project?

**ATANASOFF:**

The classified project.

**TROPP:**

Is this something that you can talk about, today, or is it still?

**ATANASOFF:**

Yes, it is, it is. This classified project related to the matter of anti-aircraft fire control. And it was at a time when we didn't have radar, when we were following anti-aircraft fire with telescopes, and the question was how to handle telescopes so that it could be trained on a moving object and give you best data on the location of the object, and how this data could then be processed to direct the anti-aircraft fire.

**TROPP:**

Were you approaching - this is extraneous, I realize, to our discussion of Clifford Berry, but I want to ask the question anyhow - were you approaching this problem from the

standpoint of extrapolating?

**ATANASOFF:**

Oh yes. And it contained the mathematical theory of extrapolation. And people always ask me why you didn't tie in the computing machine with that project...

**TROPP:**

It seems like it would have been perfectly natural at this point, but that's hindsight...

**ATANASOFF:**

Well, it seemed natural to us at that time too, but reflection will show it is not natural. And we found this out pretty quick after we thought about it a little while. Now, the problem - the problem in connection with anti-aircraft fire, which remains a problem to this very day, if you were going to throw a shell up in the air, the time and flight of the shell is sufficiently great so that this extrapolation becomes inadequate - and it becomes inadequate just because of the circumstances of the extrapolation. It becomes woefully inadequate. In other words a plane can maneuver sufficiently so as to throw out the results of this extrapolation. If it's a straight flight, of course, it's no problem. If it were a straight flight, why then we - the extrapolation would have been accurate. But the practical extrapolation for anti-aircraft fire, to this very day, is an impossible thing. You have to use guided missiles. We were not using guided missiles at that time. They hadn't been invented, and were not available from a technical point of view, although the concepts had been thought up, but they hadn't been - but no practical, technical guided missile had been invented at that time. So we - we knew we were faced with this extrapolation, and the time applied to the bullets from the gun to the plane...

**TROPP:**

Along with the ballistics tables that go with the particular projectile you're using...

**ATANASOFF:**

Sure.

**TROPP:**

...which were all different.

**ATANASOFF:**

Sure, that had to be taken into account. But the ballistics tables were accurate enough. We - and the computation in these devices was done by analog methods. But the analog

methods were accurate enough. The thing that was inaccurate was extrapolation - was the concept of extrapolation. The errors would creep in because the plane wouldn't be following the course that had been followed at the time that you took the data from the plane in order to do the extrapolation. The free will of the pilot was involved in extrapolation. And when pilots were under - were under conditions of anti aircraft fire they would exercise free will. And they still do to this very day such as we hear talking g about the American pilots in the Vietnam passing into some cleverly designed maneuvers in order to avoid the mechanism of the Russian Missile, the Sam. Of course, the missile is a guided missile in some sense but even so the parts were - even in those days were exercising maneuvers in order to escape from anti-aircraft fire. So it wasn't a problem of doing better computations, it was a problem - there was no solution to it at all. One problem - one thing that did solve part of the problem - one of the difficulties in that day, of course, was due to the - was due to the data collecting devices. They had to be selected by a man looking through a telescope, and following the anti-aircraft following the aircraft by means of a telescope, and then getting ranges by means of range finder. Now the range finder was notoriously inaccurate. And the angular \_\_\_\_\_ carried also an element of inaccuracy because the man couldn't follow the anti-aircraft exactly. The reaction time of the man was a case in point. So we were studying in that vein what we called \_\_\_\_\_ Aided Laying \_\_\_\_\_ if anti-aircraft - of aircraft...

**TROPP:**

What did you say? I missed that.

**ATANASOFF:**

Aided Laying.

**TROPP:**

L-A-I...

**ATANASOFF:**

L-A-Y-I-N-

**TROPP:**

L-A-Y...oh, I see.

**ATANASOFF:**

Now, laying - this word had crept in through the military, and when they trained I think they called it laying, and so this is anti aircraft aided laying...

**TROPP:**

When you say that this project was essentially completed, in what sense?

**ATANASOFF:**

Well, it's in the sense that it was a project which was sharply formulated in the beginning, and at this time the thing commenced to take on other dimensions such as radar, you know, towards the end - in '42 you'll see radar creeping in from England in connection with this. So it was clear that there were going to have to be companies working on the radar, and we had completely - we had substantially completed our work on aided laying, and we had pro - when we had subjective characteristics of the systems which comprised aided laying for the use of the - we had - I believe we had gone as far with that as anybody working on the project had gone. I remember to this day that there's a - that, you know, the - a man didn't just control the telescope by turning a crank. The machine - the telescope was driven by constant velocity device, and when you turn a crank you did two things; you cranked in a change of velocity, and you cranked in a change in position simultaneously.

**TROPP:**

You were getting the angular...

**ATANASOFF:**

And that is what aided lying comprises. If you lay directly you would have just turned a crank and that would have turned the telescope. But aided lying meant that you had a motor driving the telescope - a power device of some kind driving the telescope, and you're changing the velocity. But you're not only changing the velocity, you're changing the position too. It turned out that it was very much more advantageous if you changed - if you moved the telescope and telescope and the gun, and simultaneously changed the velocity. And threat combination of the two - the change in position and the change in velocity, and even change in acceleration of the angular motions of the anti aircraft gun is called a delay. So how do you compose these three terms? A change in position, a change in velocity, and a change in acceleration, simultaneously. And we had built analog devices and targets, and had gone through a great statistical study in which we measured the air of a students trained upon moving targets, and had gone through a great statistical study in which we measured the air of a students trained upon moving targets of subjects who were manning controls, and training a telescope on a moving object. And I can tell you that if you only mix a position and velocity you must mix them in such a proportion that the time constant of this mixture is - has a value of .17 seconds. You see? Can you see how if you - the position of velocity when mixed will give you a time constant. Do you see how that is?'

**TROPP:**

Umm hmm.

**ATANASOFF:**

If you take the velocity - if you take the amount of the - I turned the crank through a certain angle; It throws in such a change in position and such a change in - rate of change of positions, and if you take the portion of those you get a time constant...

**TROPP:**

What you want to do is keep that time constant fixed.

**ATANASOFF:**

But in designing the apparatus to do this job, the apparatus must have a time constant of .17 seconds. That was...

**TROPP:**

What you showed statistically.

**ATANASOFF:**

That time constant was derived statistically, it is quite exact, we're probably within a - within 10% of that value, we're probably accurate of within 10% of that value and I believe this experiment were repeated today it would give the same value.

**TROPP:**

Let's get back to Clifford Berry. He went out to Pasadena in 1942...

**ATANASOFF:**

Right

**TROPP:**

I would take it in electrical engineering or some application of that?

**ATANASOFF:**

What's that?

**TROPP:**

In electrical engineering or in some application of that?

**ATANASOFF:**

Yes. He went into a - went to work for a company who was manufacturing - yes - he went quite a ways away from electrical engineering when he went there. Of course, it was a technical subject. He went, almost immediately, into work on mass spectrographs, and he worked on mass spectrographs until he died in 1963.

**TROPP:**

Oh, I didn't know that.

**ATANASOFF:**

And Clifford Berry became one of the world's experts in mass spectrographs. And this company was then Consolidated Engineering, but I ought to give you some other name for it which it has today. It was a company which was founded by the son of Herbert Hoover. And it's called Consolidated Engineering of Pasadena.

**TROPP:**

Can you trace his career and rise in that field from your contacts with him and your knowledge about him from 1942...

**ATANASOFF:**

Yes, I have stories which I can tell. He was immediately a very satisfactory employee, and they treated him very well, and he rose. He - he rose in experience. He was the - he did many inventions for the company. He directed the work of those working on mass spectrographs with Consolidated Engineering, and he was so much - he was so successful that his salary was rapidly advanced, and between his salary and his savings, and his insurance he left an estate of a quarter of a million dollars to his wife when he died in '63. This is, perhaps an easy way to access his success in the field, in spite of very troubled - well. I've got to attempt to put together those years in some way and get them on paper. Let's just stop for a moment.

**TROPP:**

You were, rather quickly, going to trace the career...

**ATANASOFF:**

I'm going to summarize the career from this point onward of Clifford Berry, on a no controversial basis. I am to try and stay away from the serious and grave issues which compromise his later life.

**TROPP:**

I gather things would still bother you today.

**ATANASOFF:**

Yes, these are issues which move me deeply, and which I have spent a good deal of time analyzing, but I'll discuss these issues on an essentially non-controversial basis for the moment. There are other people who are concerned with these issues, and I will, therefore, treat them carefully in this tape. I, Myself, in 1942, since the project was closing - in the fall of 1942 I came to Washington and started working for the Naval Ordnance Laboratory. And I - throughout the years that followed, I kept in reasonably good contact with Clifford Berry, either by letter or by going in visiting him whenever I went to California. I suppose that I didn't visit him until after World War II had finished. But Clifford Berry had, in the ensuing period Clifford Berry - I would occasionally hear from somebody who knew about Clifford Berry's work on mass spectrograph - mass spectrograph, you know its importance as a physical entity. It's important in connection with the war work, and it was important in technology. It became an everyday instrument for laboratories to have. It was used for analyzing many substances which were entirely different from those which were initially comprehended in mass spectrograph, such as organic compounds succumb very well to analysis by mass spectrograph. And mass spectroscopy became a very important method of chemical analysis which was there were only a few companies who actually engaged in the manufacture of mass spectrographs, and one of those was the company that Clifford Berry was in - was employed with, and it rapidly became one of the leaders in the field.

**TROPP:**

Were most of his patents in connection, then, primarily with equipment?

**ATANASOFF:**

Yes.

**TROPP:**

Rather the conceptual?

**ATANASOFF:**

Yes, they were not conceptual patents. But he was one of the moving men in the

development of mass spectrograph at Consolidated Engineering. I Would - I did see Clifford Berry. I visited his home. He had a new home. I did not visit him until he had built a new home in the side of the mountains outside of Pasadena in an area called Alphadena. Do you know the area...

**TROPP:**

Oh, I know the name.

**ATANASOFF:**

Clifford Berry got an architect and built a new home and he had - he had finished a new home by the time I first visited him in Pasadena. But during the ensuing years I visited him frequently. At first he seemed very happy. I would go and - I would go out - I usually - what happened. I would go out and have dinner with the Berry's. Jean was always happy to have me come. I felt as if everything was all right. Then there came a time when I went to see Clifford and he told me, in detail, about some serious automobile accidents. I think at that time there would have been just one accident, but it was a serious one.

**TROPP:**

That he was involved in"

**ATANASOFF:**

He was involved. So then...

**TROPP:**

To what extent: in terms of, you mean physical damage that he suffered?

**ATANASOFF:**

Well, he didn't look quite normal on this visit, and he said that he'd been - I didn't raise the question but he raised it, himself, and he said he'd been in this accident, and he'd been hurt pretty badly.

**TROPP:**

This was still 194...

**ATANASOFF:**

What's that?

**TROPP:**

This is still in the 1940's?

**ATANASOFF:**

Oh no. No, no. This was in the 1950's. This was after World War II. And I ought to have dates for these things. I can reconstruct dates, but I'll have to do reference work in order to reconstruct dates damage that he suffered?

**ATANASOFF:**

Well, he didn't look quite normal on this visit, and he said that he'd been - I didn't raise the question but he raised it, himself, and he said he'd been in this accident, and he'd been hurt pretty badly.

**TROPP:**

This was still 194...

**ATANASOFF:**

What's that?

**TROPP:**

This is still in the 1940's?

**ATANASOFF:**

Oh no. No, no. This was in the 1950's. This was after World War II. And I ought to have dates for these things. I can reconstruct dates, but I'll have to do reference work in order to reconstruct dates. Then I'd heard that he'd had a second accident - a second automobile accident. And then I went to visit him and I noticed that Clifford Berry was less himself, and he was less happy at \_\_\_\_\_ than he had previously been. He was unhappy at - this must have been - let's see, this must have been towards the end of the '50's. Say '58 or '59. It might have been as late as 1960 that I made this visit. I noticed that alcohol flowed a little more freely at Clifford Berry's house at this time than it had previously. Both Clifford Berry and Jean were drinking a little more. I noticed there was a strain between Clifford Berry and Jean. Well, I came away feeling uneasy. And this was the last time that I saw Clifford Berry alive during his life. Sometime in 1963, it might have been - this time may have been as late as '61 or '62. I can't be sure at the present time - this last visit with Clifford Berry. The - during 1963 I received a letter from Jean telling me Clifford Berry had - I knew he was unhappy with his work and he'd

left his company and taken employment with another firm in the east who was going to build mass spectrographs. He had gone to work for them, and he had died of epilepsy in an apartment which he had. He'd left his family in Pasadena - his wife and two children. He'd gone to this new job on Long Island, and he had died of epilepsy, according to the letter by...

**ATANASOFF:**

...Jean, in an apartment which he had rented. I immediately took the phone in hand and called Jean to get more details. I did not get - I did not, at this time find out much more, and nothing happened until 1967 or '68 when I became involved in a litigation on computing machines and wanted to examine Clifford's files and find out more about Clifford, since he was involved in our working computing machines. And I went out and visited Jean in Altadena, and Jean at that time told me that Clifford Berry had not died of epilepsy, but he'd died of suffocation. And she said she had information through the police in Long Island that he'd self administered this suffocation. I commenced to realize that Clifford Berry had been under much more strain than I had been aware during these last years of his life, even though I had left him the last time with a good deal of apprehension. I talked to the personnel man at the company where he had worked, who had by the time I reached him retired, and I talked to psychological advisors - a man who had been psychological advisor to the family, and gradually a story - a very good grim story of nerve strain and difficulties commenced to develop. When I got this picture in mind, I felt that I would like to know a little bit more about Clifford Berry's last days, and in company with a counsel for Control Data Corporation, with whom I was then associated. I visited the scene of his death. I was able to talk - to get information from the Police Department, who searched their files, and from the man who owned the apartment that Clifford Berry - it was a set off portion of the man's residence, so it wasn't just an apartment owner; it was a man who had a house in which Clifford Berry had rented an apartment. And he told me of Clifford Berry's last days there. What had happened was that the man had come out this morning - that Clifford Berry had been rooming with him for a few months. He had the apartment to himself, and he - the man furnished the maid work for the apartment. He had somebody who came in and did maid work in his own house, and she also did maid work in Clifford Berry's apartment. He had commenced to notice - he said nobody was anymore satisfactory as a renter as Clifford Berry. Clifford Berry was treated the - Clifford Berry was nice to visit with, and he did often visit with Clifford Berry since Clifford Berry was along he had time around the place. He, however, commenced to notice that Clifford Berry was evidently consuming a considerable amount of alcohol because there were - there were bottles in the garbage - more bottles than normal in the garbage. This morning he came out to go to his own work, which was, I believe, was the U. S. Post Office. He had noticed this morning as he started to work that Clifford Berry's car was still there. He went back up and rapped on the entrance to Clifford Berry's apartment but received no answer. He went back down to his car and started to drive out, and then he paused, and he said, "Maybe there's something wrong with Clifford. He's evidently still there. And I ought to arouse him. He went back up and rapped on the door again, and when he could not get any answer he

broke in and then, he says, "I entered Clifford Berry's bedroom and Clifford Berry was asleep in the bed". And he said, "The bedroom was a picture of tranquility and peach. The bed clothes were smooth up around Clifford's head. His arms were under the covers. And then he said, "I noticed there was a piece of plastic over Clifford's face. And he said, "the man can't breathe, I must help him". And then he realized that Clifford - that he'd been that way for some time, and that Clifford Berry was dead and he went and called the police. And I believe did not disturb the plastic. Well, the police - it was obvious that Clifford died from asphyxiation. The police found a brain plasma concentration of alcohol of, I believe, .012%. Now, the question is what is a brain plasma concentration of .012%? Is this high or low? I consulted with people expert in the field, and they told me there was essential equilibrium in a concentration of alcohol in the blood - in the brain plasma and blood plasma, and so this would roughly be a concentration of .012% of alcohol in the blood. I believe the blood concentration was not measured. This is not a high concentration in the blood. I believe the blood concentration was not measured. This is not a high concentration in the blood. I mean to say a person can still navigate. As a matter of fact, you know for a long .015% of alcohol was a standard for intoxication of a man driving an automobile. But a man who had .015% of alcohol in his blood was becoming dangerous on the highway, but he could still drive an automobile, so he was still capable of walking, and capable of locomotion. So it was clear that Clifford did not die of alcohol. He - the alcohol should have numbed his sensibility, somewhat. The police presumed that Clifford Berry, in a state of intoxication, put the plastic over his head, and though he still had a little air to breathe, got into bed, twisted the plastic around his neck - it was twisted around his neck - and got in bed and drew the clothes up around him in a tranquil position, and passed into oblivion. On the other hand, other experts in Forensic Medicine assure me that such an event could not have happened. That a person, when he became - with that much alcohol in his blood, he certainly was capable of feeling and thinking, and that the moment that the air became short, he would have gone into a state of motion, and he would have disrupted the bed-clothes and sought to uncover his head regardless of his own - of the command from his own mind. He couldn't have just snuffed out his own life with this resolve. So we have here a mystery, and to this day this mystery is not solved.

**[End of Tape]**