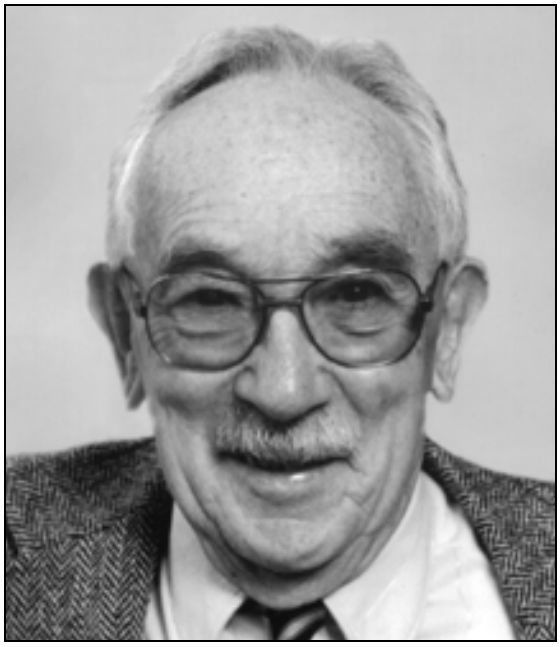

JOHN TODD
(1911 - 2007)

INTERVIEWED BY
SHIRLEY K. COHEN

March 29 and April 5, 1996

ARCHIVES
CALIFORNIA INSTITUTE OF TECHNOLOGY
Pasadena, California

Subject area
Mathematics

Abstract
John Todd was professor of mathematics at Caltech from 1957 to 1981. This interview in two sessions in March and April of 1996, conducted by Shirley K. Cohen, briefly covers Todd's childhood in Northern Ireland and traces his educational path as an aspiring engineer to Queen's University, Belfast (bachelor's degree, 1931), where he studied mathematics under A. C. Dixon; after Queen's, to Cambridge University as a graduate student (without degree) for two years under J. E. Littlewood. After four further years teaching in Belfast, Todd was hired at King's College, University of London, where he met his wife, the mathematician Olga Taussky, then a postdoc; their marriage in 1938. War work initially involves degaussing of ships for the British navy, then evolves into establishing centralized mathematical computing for the Admiralty. Postwar immigration brings Todds to US, 1947, both to work at US Bureau of Standards; comments on McCarthy era experiences there. John and Olga accept teaching jobs at Caltech, 1957. Note on portrait of Olga, painted in Belfast by mother of crystallographer P. P. Ewald [Clara Ewald, 1939]. Relates story of saving

German mathematicians from French-Moroccan troops, 1945, in Oberwolfach in the Black Forest; mathematical institute there survives today. Discussion of teaching computation at Caltech (numerical analysis, numerical algebra, matrix theory); brief mention of mathematical colleagues F. Bohnenblust, A. Erdélyi, M. Ward, and H. P. Robertson. Olga's success as a teacher, although initially barred from professorial ranks. Remarks on state of mathematics and beginnings of computer science at Caltech; mention of student H. H. Hwang.

Administrative information

Access

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Contact information

Archives, California Institute of Technology
Mail Code 015A-74
Pasadena, CA 91125
Phone: (626)395-2704 Fax: (626)793-8756
Email: archives@caltech.edu

CALIFORNIA INSTITUTE OF TECHNOLOGY ARCHIVES

ORAL HISTORY PROJECT

INTERVIEW WITH JOHN TODD

BY SHIRLEY K. COHEN

PASADENA, CALIFORNIA

http://resolver.caltech.edu/CaltechOH:OH_Todd_J

CALIFORNIA INSTITUTE OF TECHNOLOGY ARCHIVES
ORAL HISTORY PROJECT

Interview with John Todd **by Shirley K. Cohen**

Pasadena, California

Session 1	**March 29, 1996**
Session 2	**April 5, 1996**

Begin Tape 1, Side 1

COHEN: Shall we start from the beginning?

TODD: Yes, that's a good place to start. Both my parents were elementary school teachers in Ireland. They studied in Dublin—this was before the separation [in 1920]. My father, in addition to his teaching, of course, had to look after the choir in the church attached to the school. [Laughter] And he was also quite active in chess—won prizes and so forth. One other thing: I found out that when he and my mother were courting, as they say, they wrote to each other in Esperanto.

COHEN: Now, where would they have learned that?

TODD: Well, that was supposed to be the universal language. So you pick it up yourself. Anyway, we were living quite in the country, in Carnacally in County Down. I couldn't even go to school; it was too far to go for a long time. So I never learned to write properly.

COHEN: But couldn't you have gone to school with your parents?

TODD: Well, my father had his bicycle. And I think when they married, my mother was not teaching. I was the first child.

I was born in 1911. We were still living in this place in the country in 1916, when there

was a rebellion in Ireland. And I remember that I had a little popgun—you know, one of these things that you break and you fire a cork and it makes a noise. There was some trouble about guns then, and I had to hide my popgun in a big yew tree, where the police wouldn't find it. [Laughter] I was five then.

Then my father changed his school to somewhere near Belfast, so that the family could have a better chance with schools. So I did go to his school. It was a little country school—I think only three teachers.

COHEN: Was that a big move? You lived in southern Ireland and then moved to the north?

TODD: No, they were never in the south. We came from the north. But Ireland was united then, and the training college for teachers was in Dublin.

As I said, I went to my father's school for possibly a couple of years or so. And I do remember the Armistice [World War I]—hearing the bells. And there we were in the country.

Then I think the family decided to move into Belfast. Then I went to another elementary school in Belfast. The only thing I remember was that the teacher, William Rea, was a contemporary of my father's. Rea belonged to the British Israelites who believed that the British were the lost tribes.

COHEN: Was he Irish?

TODD: Yes. I went to this elementary school around 1920; then I went to secondary school. Then I got a scholarship. Usually, people who got scholarships were forced into French, Latin, Greek. But somehow—and I don't know how I did it—I managed to convince the people that I was going to become an engineer.

COHEN: You must have been already very good at mathematics.

TODD: Well, when I was in my first home, there was a famous children's encyclopedia that my parents had. And there were little problems in it—which nowadays you would do by algebra. But I didn't know any algebra, so I played with them and thought them out.

COHEN: Now, English was the language in your home?

TODD: Oh, yes.

COHEN: You didn't speak an Irish language?

TODD: No, no. We were a Protestant family—Presbyterian to be precise. [Laughter]

So, somehow or other, as I say—this still amazes me—I was able to convince the people to let me do engineering. This had important consequences later, because then I never learned any Latin in my life. My parents had both Latin and Greek books in the home. But I never had any Latin. So I did engineering.

The school [in Belfast] was called Methodist College. It was a secondary school. It was mixed, mixed, mixed—mixed between the sexes and mixed between day people and boarders. I was living at home.

COHEN: And this school would have been for anybody that wanted to go, Catholic or Protestant?

TODD: Yes, yes. I don't think there were many Catholics. At least I didn't realize it then. But I don't know.

So I studied there until 1928. And in my final year there, you had a sixth-form, a sixth scholarship form, an extra year, if you were preparing for scholarships at universities. And in this last year, I only did mathematics, you see. Oh, yes, one had to write an essay once a week.

COHEN: And everything else was mathematics?

TODD: And engineering as well. So I would say that during that time, I did my first piece of research in engineering.

COHEN: While you were really in high school?

TODD: Yes. There was a prize given by one of the benefactors of the school, a famous surgeon, Sir William Whitla. We—Archibald Gullan and I—he later went on to become a civil engineer

in the Royal Air Force—we designed machine tools and built a jig for valve grinding. And we got some sort of prizes for this.

Then I went to Queen's University in Belfast, which was the natural thing to do. And I was there for three years.

I was fortunate, I think. My professor at Queens, A. C. Dixon, knew the head of the mathematics department at the Belfast school. He [the Belfast school teacher] was a man of the first order. He was brought up in Manchester with Horace Lamb. And then he went to London, to Imperial College, and worked with Sydney Chapman.

COHEN: What was his name? Do you remember?

TODD: Yes, the name was T. S. Fazackerley.

COHEN: So he was your instructor the last year in your sixth form?

TODD: Yes. And he persuaded me to enter St. John's College for a scholarship at Cambridge. And I entered. You see, there you can get either an exhibition or a scholarship. And the exhibition was forty pounds, the scholarship was a hundred pounds. I only got an exhibition; they said I was high on the exhibition list, because my applied mathematics was not as good as it should be.

COHEN: So it just had the two names, because one had less money? What did the word "exhibition" mean?

TODD: It's a grant of money. It's a standard. It still exists. It's just that one is second class; the other one is first class. [Laughter]

COHEN: So you then left Ireland and you went to England?

TODD: I graduated from Belfast in '31—I think '28 to '31 was the time. And then I went to Cambridge as a research student.

COHEN: So you already had your college degree then from Belfast.

TODD: I had a bachelor's degree from Belfast.

COHEN: And this man, Fazackerley, was your teacher there?

TODD: No, he was the teacher at my school, which was Methodist College.

COHEN: So he was really a big influence? He directed your life in some ways.

TODD: Exactly. And also my family life, too, you see.

At that time in England, people who came from other universities to Cambridge had a choice of taking another bachelor's degree there—which was the usual thing—or doing research work as a graduate student. But if you were doing the bachelor's course, you had to have an exam in Latin. And I hadn't got this, you see. There was no choice for me, so I became a graduate student at Cambridge.

COHEN: So you left your family and moved to England.

TODD: Well, for two years I was in Cambridge. And then I was offered a job back at Belfast, teaching at the university.

COHEN: Let me just ask you: Was the 40 pounds enough for you to live on?

TODD: No, no. When I went to Cambridge ultimately, I got a fellowship from the University of Belfast—150 pounds or something. And St. John's College [at Cambridge], in view of my earlier tests—they tested me earlier for the entrance scholarships, you see—gave me a research exhibition, which was a lot more money. So I was comfortable.

Now I did not take any degree in Cambridge. You see, at that time, about 1930, they only started to consider PhDs in Cambridge. The normal thing was, you went there and got a bachelor's degree. You stayed on two years, doing nothing if you liked, and got a master's degree.

COHEN: And then you went off to do a profession of some kind?

TODD: A profession, or whatever. But my teacher was a very famous man, and my supervisor—[J. E.] Littlewood. He didn't approve of doctoral degrees. He said, "It's only to get a job. I will write a postcard for you." [Laughter] And he never had any doctorate, nor did his teacher have a doctorate. His teacher was a famous English mathematician who became a bishop, Bishop Barnes. Many people took "orders" as they say. So when you talk about these academic fathers, I'm a double bastard, you see. [Laughter] Some people who went there at the same time as I did insisted on getting a doctor's degree. Fred Hoyle, for instance, never took a doctor's degree there. Partly, this was financial, because of income tax regulations. As long as you were being supervised nominally by somebody and not getting a degree, you were a student who didn't pay taxes.

COHEN: So how long did you stay at Cambridge?

TODD: Two years. And then I went back to Belfast for four years, teaching at the university. When my teacher at Belfast moved to London, then he brought me with him.

Better put the names down, just for the record. My professor at Belfast first was A. C. Dixon. He was a very famous man. He retired, and he was followed by a man called J. G. Semple. Dixon was really a very famous man. They said that Belfast at that time had the largest shipyard in the world, the largest tobacco factory in the world, the largest rope works of the world, and A. C. Dixon. So I was fortunate.

Then I went to London and King's College in '37 with Semple. There were two professors there—one was [G. S. F.] Temple and one was Semple. Temple was the head of the department. He was a Catholic. And Semple, who brought me there, was a Protestant. And these people could only talk about religion together. [Laughter] Their subjects were quite different. Temple was an applied mathematician, and Semple was pure mathematician.

Then Temple got sick—the flu or something—in my first term. So being the youngest man in the department, I had to teach his class. It was not my subject—it was group theory. But I was interested in the axiomatics when I gave my course, and I suddenly found a problem which should have been solved, you see, and had not been. And I could find nobody to help me. And

that's how I met my wife [Olga Taussky Todd]. She was already in another college, Westfield College in the University of London. You know, there are about twenty colleges in London. So I met her there. And somehow or other, we got married.

COHEN: Had she been there very long when you met her?

TODD: No. She had studied in Vienna. Then after her degree, she was in Göttingen. And then she was invited to Bryn Mawr; and then she got a postdoctoral fellowship in Cambridge. And that lasted until '37, when she had to get a job.

COHEN: So, did she help you solve this problem?

TODD: Not at that time, but later on. I'll come to that later.

We got married on the infamous day of Munich [the Munich Agreement, September 30. This ceded the Sudetenland to Hitler.]—when Mr. Chamberlain claimed "Peace in our time" and all that. That was '38. And then there was this year of "peace." And then the war started. The colleges were evacuated to safe places. Olga had gotten an extension of her fellowship for a year and could go anywhere. I was waiting to be called up. I expected to be called up very soon, but it took a long time. [Laughter] And we went to Belfast then—mainly to take Olga's mother and sister there, where I thought they'd be safe. They were living in London at this time.

During that time, there was a young man from my school there. He had become a very good mathematician. And he worked with Olga on this problem that I had asked her. [Laughter] This man's name was Ernest Best. He worked in several fields of mathematics and did quite nice things. And then suddenly he got religion and became quite famous in the Presbyterian Church. And then he retired from that, and only recently I heard that he taught theology of some sort at St. Andrews University, and then became professor of theology in Glasgow. He was a very bright young man.

So it was about a year before I got involved with war work with the navy.

COHEN: Meanwhile, you were teaching?

TODD: Well, it gets so complicated. [Laughter] When I left Belfast, a colleague of mine whom

I knew as a graduate student at Cambridge, got my job, you see. His name was Joseph Gillis. And then he got called up before I was, and we gave him our apartment in London, which was empty, you see, because we were back in Belfast. He ultimately went to Israel, and was dean of graduate studies at the Weizmann Institute.

During—or even before the war—the British realized that radar would save the country, if anything. And there was a lot of fuss about this, that there weren't enough technicians to do this. So C. P. Snow—whom you must have heard of—organized a census of scientists and engineers. And this was interesting historically because it was, more or less, broadcast on the BBC—that all scientists and engineers had to go to the post office and register. This was like the town crier of medieval times. Then the civil servants were supposed to do the classification of these people, but they weren't able. They had no knowledge.

I think this must be the summer of 1940; we went back to London, and I was drafted into this to help the Snow people classify these people who had filled in their cards. So this, of course, gave one a chance to see a job for oneself. And so I found a job for myself, which I thought would be suitable for me, the best way to use what talents I had.

Originally, the magnetic mines were causing a great amount of trouble. So they had this degaussing of ships to be done. There were various places where they put coils around ships and measured the magnetic field and tried to neutralize it so it wouldn't trigger any mine.

I got orders to go to Falmouth, to be in charge of this arrangement, in which they took the ships and neutralized them. [Laughter]

And just before I went there, I got another letter from the Admiralty, saying, "These orders are cancelled. You have to go to Portsmouth." The Germans then started to drop acoustic mines that were triggered by the noise of ships. And we had no idea of how to counteract this. You can't make a ship's engine quiet.

So I went to Portsmouth. In charge of this group was Teddy Bullard. You may have heard of him. He and I very soon agreed that this was not my place. It was an experimental place, trying to build noisemakers and things. We were friends, but it was just clear that I'd been misassigned. And I knew better where I wanted to go myself. [Laughter]

So I got transferred from this mine design department to another, bigger group. And this was rather boring and frustrating. The idea then was, if you had a ship and it came to a magnetic mine, the mine would be detonated. The field of the ship would detonate it at a distance. So you

had to put a delay in the mine so that after it was triggered—a signal that the ship was going on so many knots, and so forth—that the mine would actually detonate under the engine room of the ship, you see. And this was all rather silly, elementary calculations about circuits and so forth. That was the first time maybe I came in contact with Caltech, because we had to live with the book by Mr. Smythe [William Smythe]. I had a book on electricity and magnetism—which I have at school, I think—in which Millikan was mentioned. That was probably my first contact with Caltech, then Smythe.

COHEN: And he had many problems in his book.

TODD: Yes. You see, some silly problems like: Since the ship's field detonated the mine, it lost some energy, and therefore the ship's speed was reduced by a millionth of power. [Laughter] These kinds of problems.

Anyway, this I found very boring, and I saw that it was really sad that the physicists who could help, you see, with them were being forced to do very routine mathematical problems, just exponential functions, and so on. So again, somehow or other, I persuaded my bosses that this was not right, and that I would like to arrange that all the computations of the Admiralty were centralized and done by mathematicians who could do them, and let the physicists get on with really applied mathematics.

I don't know how I talked my way into this, but I got transferred to London.

COHEN: And you were back then with Olga, in your own apartment?

TODD: No, no. By that time, we'd given up our apartment. And she had gone to Oxford, where her college was evacuated to. So I came to London. I was in the middle of the bombs in London. Also, our lab was bombed in Portsmouth.

So I was in London in the early forties. And then Olga was feeling frustrated, too, with teaching the girls at her college. And she got transferred to the Ministry of Aircraft Production to do aerodynamics, so we reunited.

Well, of course, there were many Americans in England then. Olga had spent a year in Bryn Mawr before this, so she knew some of the Americans.

COHEN: Let me back up a minute. Your centralizing the mathematics turned out to be very successful, then.

TODD: Yes. And then I was involved with trying to set up a national mathematical laboratory, like the National Physics Laboratory, only for mathematics. So there was quite a bit of politics about that. And the Americans were doing the same thing here—Ed Condon at the Bureau of Standards. He had a young man, John Curtiss, who was in a mathematical family. His father was a professor; his daughter's husband was a professor at Princeton and had known Olga when she was at Bryn Mawr. So we were invited to come here to the U.S. to set up this National Applied Mathematical Laboratories.

COHEN: And did you already have some computers in those days? It was the beginning of the computers.

TODD: It was the beginning, but these were very primitive.

This was supposed to be at UCLA [University of California, Los Angeles]. They wanted a field station of the Bureau of Standards. But the Bureau of Standards mathematicians don't like to keep regular civil service hours and they don't like to dress formally. So they wanted it as far away from Washington as possible. It was offered to Caltech, but DuBridge said no; he said there wasn't space for it, or something like that.

COHEN: Now this is after the war?

TODD: Yes, '47 I think.

COHEN: But you stayed with this effort in London until the war was over?

TODD: Oh, yes, and then I taught—I think in '46, I went back to teaching numerical analysis in London for the first time. It became my subject. It was not my subject before. I mean, I had rather exotic interests. But I had spent five or six years on practical things.

One was not sure what one was going to do after the war. Some of the people stayed in the universities and moved up. And many of us had to think what we were going to do. But

anyway, Curtiss, Condon, asked both of us to come to help organize this place at the Bureau of Standards. When we came, the buildings weren't ready at UCLA, so we spent three months in Washington getting to know the ropes. And then, we'd known [John] von Neumann in England. I had some influence in getting him to turn to computers. He had decided he was working presumably on the atomic bomb, and decided it would have to be all computational.

So we spent three months in Washington, and then another semester or three months in Princeton with von Neumann. And then finally we came out here, six months later, to UCLA.

Unfortunately, I've had asthma since I was so big. We got a house in Westwood which was so dirty that I spent most of the time under the weather. They wanted us to stay, but I said this didn't seem good. So we went back to England for a year and thought it over.

COHEN: Where did you go back to?

TODD: To King's College. I had taken a year's leave to come here, you see. So I went back to London. And then they offered us a job in Washington, which would mean maybe less allergic things than out here. So we spent ten years in Washington.

COHEN: And both of you were offered jobs?

TODD: Yes. And then, I think, Caltech decided they had to have some computing.

COHEN: Did you enjoy those ten years in Washington?

TODD: Very much. It's crazy. One had to get drunk every Friday night. Decisions were made and changed, and so forth. This was the McCarthy era.

COHEN: Had you and Olga become citizens?

TODD: As soon as we decided to take these jobs in Washington, we applied. And so we became citizens then.

COHEN: So Washington was a strange place with McCarthy and all.

TODD: Yes. I had to go and give evidence about my staff, if I knew anything derogatory about them, or something else. Obviously I was not an American. And I would pronounce words like laboratory the wrong way, you see. [Laughter] And Condon was fired. He left and went to Corning Glass Company. And then it even got worse with Alan Astin being fired because of this battery additives case.

COHEN: Okay. Now what happened with this Alan Astin?

TODD: It's a long story. A long war in the Pacific was expected. We were never sure about the atomic bombs. So stockpiles of all sorts of equipment were made all over the islands in the Pacific, including batteries—for tanks, for cars, for everything. And these got dried up in the sun. People tried to cure them. And one man—a bulldozer operator—found that by putting Epsom salts in the battery, this revived it. He then started to sell this all over the country in America.

Now, the Bureau of Standards had been involved earlier in testing these various things to cure batteries.

COHEN: Were these batteries brought back to the United States?

TODD: For cars.

COHEN: Brought back from the islands?

TODD: No, no. But there was mail fraud involved, you see. People were advertising this. So the Post Office asked the Bureau to investigate these claims.

Now, it must have been '52 or '53, under Eisenhower. And there was a great amount of fuss about small business and so forth. And this man, who was selling the Epsom salts at a thousand times the price, complained that he was being persecuted by the Bureau of Standards because they said his stuff had no significant effect; pure water was as good. But nevertheless, the Bureau of Standards is in the Department of Commerce, and the Assistant Secretary of Commerce who was responsible for the Bureau of Standards just fired the director, Alan Astin, because he said he was not taking account of the play of the marketplace. The director of the

Bureau of Standards was a nonpartisan job, but he was fired.

COHEN: Did McCarthy have anything to do with this?

TODD: Well, this was not McCarthy. But the climate. McCarthy was earlier, you see.

Well, then the National Academy took this up, and there was a great lot of hearings and so forth. And finally, after six months or more, the director was reinstated. Somebody should write a play about this.

COHEN: So you're explaining why, on Friday night, you'd get drunk from a week of work. You're giving me the reasons.

TODD: Yes. [Laughter] But there's more to it than that, I can tell you. Charlie Wilson was the Secretary of Defense. And the man who was in charge of Commerce saw that he was going to lose his case against Astin. So he was determined to punish the Bureau of Standards. He talked to Wilson and said, "The Department of Defense will give no more money to the Bureau of Standards." And the funding was cut in half overnight. I had to fire about a third of my staff. They were in no danger, you see. They had by then some experience with real computers. And the universities wanted them, and the industry wanted them. So they were not losing jobs, but they had to leave. And the Bureau of Standards was a very nice place to be. And this field station at UCLA was just abolished, completely. It was entirely supported by the Office of Naval Research for a long time. So it closed, and UCLA took it over, but they said they didn't have the money. The regular people didn't want to take on the people who were there—more or less semi-permanently. So it petered out.

COHEN: So you took charge of a smaller group in Washington.

TODD: Yes, yes. Anyway, then the Bureau of Standards also decided to move. Their buildings were fifty years old by then, on Connecticut Avenue, and some of the embassies wanted that space. So they were going to move the Bureau out to Gaithersburg. We didn't like that idea, because we were living in Washington, and everybody who came to Washington for a committee meeting of NSF [National Science Foundation] or the [National] Academy [of Sciences], or

whatever, we could see them. But if you were living twenty-five miles out? So we were not happy about this change. So when Caltech offered us jobs, we came here. And I'd gotten cured of the asthma.

COHEN: And what year would that be?

TODD: That was '57.

JOHN TODD

SESSION 2

April 5, 1996

Begin Tape 2, Side 1

COHEN: Last time you spoke briefly of your family. And you did mention that you would like to say a little bit more.

TODD: Yes. Both my parents were elementary school teachers. They were trained in Dublin because Ireland was united then, and that was where the training colleges were. But they taught only in the north of Ireland.

COHEN: Did they meet while they were in their training program?

TODD: This I don't know. I was the eldest child. My next brother did mathematics and then became a teacher in the secondary schools. He must have been there before the war [World War II]. Then he was in the war. And then he was teaching at Methodist College, which was our secondary school. And I think he became head of the mathematics department there when Mr. Fazackerley, whom I mentioned before, left to become headmaster at another school in Northern Ireland. And finally, when Fazackerley retired from his school, my brother took his job.

COHEN: What was your brother's name?

TODD: William. Will, W. R.

My next brother, we hadn't enough money at that time to send him to the university, so he took an external degree from London. What you do, essentially, is by correspondence, and then you are examined. He worked—as you probably know, Northern Ireland was quite famous for linen, flax. And there was a linen industry research institute there. And he worked there. And I think he took some time off to work for an actual firm. But finally, he came back and was director of this linen industry research institute, which became really textiles. His name was Herbert; Herbert Alexander Conway. He got three names. [Laughter] He got a medal from the

British government for services—OBE, Order of the British Empire, or something like that.

The third brother said that we were not earning enough money; he wasn't going to do mathematics. And he got into civil engineering. Then, in the war, he got conscripted, drafted into the marine engineers, and was building dams, and these cooling things for nuclear power plants. And he's retired and living in London now.

A silly aside here. [Laughter] The German crystallographer [Peter Paul] Ewald came. He was a refugee and he came to Belfast as head of mathematical physics.

COHEN: His daughter married Hans Bethe.

TODD: We met them. I was hanging around just waiting to be drafted. And he was new to the place. His mother painted Olga. And she is a famous painter.

COHEN: Where is this painting?

TODD: This painting is in my house, but it is to be given to Caltech. She has paintings in the National Gallery in London, including one of Rupert Brooke, who was one of the English poets killed in the First World War. And, of course, she painted every physicist who came.

COHEN: Did she paint under the name of Ewald?

TODD: Yes, yes. At first, she decided that she wanted to paint Olga and said, "I will pay you a shilling an hour for sitting." Olga was quite a good sitter, you see. She could think and talk. [Laughter] And finally, when Olga's mother and sister went to America to join their elder sister—during the war they went—we bought the painting for five pounds. But Olga's mother wouldn't take it. [Laughter] She didn't like it. [Laughter] So it survived all the bombings we had in London.

Ewald had, apart from Mrs. Bethe, another daughter. And she and my brother George were dating. But my brother was sent to Australia, and that finished that. He married an Australian. Otherwise I might have been in the Bethe family. [Laughter]

COHEN: So you had three brothers. Did you have more than three brothers?

TODD: And a sister, who is still living in Belfast.

COHEN: Did she do mathematics?

TODD: No, no. She didn't go to the university at all. I suppose she really looked after my parents. But she is living in Belfast, and is the source of all the information. She is the correspondent.

I think I told you that my father was a chess player, and used to travel to these various competitions. But after the marriage took place, he wasn't allowed to travel. [Laughter] And so he took up editing columns in the newspaper, on the side, from his teaching. He did the chess column.

COHEN: We then spoke of your education, and we spoke of you going to London. But then we did not speak of going to Germany in 1945.

TODD: This I would like to talk about now. This was probably the best thing I ever did for mathematics. It happened this way.

When the war was ending, the authorities decided they had to capture German scientists, and in particular those in nuclear work and in aerodynamics, in the rocket business. Somebody was captured and brought to London. And they couldn't understand him. He, more or less, denied all knowledge and so forth. And Olga was then working at aerodynamics, and knew German. There was an American who was in charge of the scientific group in London, and we knew him; so he brought her in, to try to help in the debriefing.

It turned out that he [this prisoner] came by mistake. He was captured by mistake. He was called Walter. And there was another Walter that they wanted, both at Darmstadt. And they got the wrong one. I know that he carried this little safe conduct in his pocket, a picture of himself and [Richard] Courant, arm in arm going up a mountain. And he was doing mathematical work, numerical computations during the war—not aerodynamics or anything else. So I was called in, since this was my specialty then. And I found out then that there was a lot going on—that in the Black Forest they had this little center where they tried to keep prisoners of war who were mathematicians who had been captured.

COHEN: And get them to work and to do mathematics?

TODD: Well, yes, but not war work. So we decided to go to Germany and investigate some things.

COHEN: Now, when you say "we," who is that?

TODD: My colleagues and I. We got permission. We were put by the navy in a crazy uniform, with navy hats and epaulets. The war was just ending.

I made up a team, and the team included one of my colleagues at the Admiralty computing service—Reuter, who happened to be the son of the future Lord Mayor of Berlin. He had come to Britain much earlier, and was a real English public school boy. And Fred Hoyle joined this group.

We got all our shots in one day, and we went to Mainz, I think, because they had quarters there. And Fred Hoyle got so sick that we had to send him home. [Laughter]

Anyway, we finally found this center. First Reuter said he wants to see where he was born. He was born in Magdeburg. And so we went and found it. [Laughter] We had permission to do anything, you see. And he saw his house where he was born. Then the Russians were just coming in, so we didn't go any further east. So we went round and round.

And finally, the team was only Reuter and myself. And we got to this place in the Black Forest. We found it. It was in the French Zone. This turned out to be a hunting lodge originally, which some wealthy American had built. The University of Freiburg had evacuated their books and things there, and then collected mathematicians who were in trouble in various ways.

COHEN: So this was a saving effort. Did the German government know about this?

TODD: Well, it was permitted. I mean, things were probably so confused, that they didn't know what they were doing.

COHEN: But in some sense, these people used it to save people.

TODD: Yes, this was used to save people. I remember when we were driving to this place, we had been six weeks or so living in the same clothes. So we asked permission to stay at this place for a weekend, and have somebody wash our clothes. [Laughter] I knew some of the people by name—not personally, though.

COHEN: Did you have any idea of who was there before you went?

TODD: A little, from this man Walter, yes. There was even a man with English nationality there.

COHEN: In some sense, these people were detained; they were not free people to come and go.

TODD: We passed a battalion, or company, of Moroccan troops on the road. They had a little deer as their mascot. So we got to this place, and they welcomed us and they gave us permission to stay. We put up a notice on the door that this place is the property of the British Navy. [Laughter]

COHEN: This hunting lodge where the mathematicians were?

TODD: Yes. [Laughter]

COHEN: It's like a Gilbert and Sullivan opera.

TODD: It is, yes.

COHEN: Were all the mathematicians still there?

TODD: Some of them, yes. Some of them had gone home to where they hadn't been for a long time. But there were quite a few there.

The next morning, Reuter went to Heidelberg to get some food rations for us, and gas for the car. And I was sitting, debriefing the people there, when suddenly screaming started. These black Moroccan troops came up and wanted to take over the house. They were French troops. I heard this, so I got up and put my uniform on and my gun. [Laughter] Then I talked to this man

who was trying to billet his people and take over the house. So I explained that this was the British Navy. And I had to do it in French, you see. [Laughter] But finally, he agreed, and the people were not bothered. And they went away to try their luck elsewhere. So this was my way of saving this institute from the Moroccans. They would have burned the books; there's just no doubt about this.

We stayed there several days. Then Reuter came back, having missed all this excitement. [Laughter] Then I went back to London in due course. Then I knew the French academic people in London. Before I left Germany, I had dinner with the local government. And I ate wild boar for the first time, wild boar shot in the hills. It was the first time I ate wild boar. [Laughter]

COHEN: And then what happened to this place? Did it continue?

TODD: Yes. Then I went back to England, then to Paris and told them they should look after this place, since it was in their zone. So we got one of the French mathematicians dressed up in uniform, too. And he had a revolver of some kind, and he put it on. And then one of the officers, he tried it. [Laughter] And he shot into the floor. [Laughter] Anyway, he then got this under some sort of status there. And this is flourishing to this day.

They had meetings for a week—about twenty, thirty people or more on all subjects. Very efficient, because there is nothing within miles; you have no friends within miles, no movies or plays to go to, and you just have to do mathematics or walk in the hills.

Then Volkswagen supported it.

COHEN: Does it have an official name?

TODD: Well, it's a Mathematical Research Institute at Oberwolfach. I think the staff has changed from the University of Freiburg to the state of whatever [Baden-Württemberg] in Germany. It has changed slightly just recently. But it has always grown bigger. So now, instead of having an old wreck of a castle, they now have really a resort motel in the Black Forest, with new buildings. It is flourishing.

COHEN: And you take credit, because you saved it from the Moroccans.

TODD: [Laughter] I saved it from the Moroccans, yes. It just happened that I was there on the right day; had I been there a day later, the situation might be quite different.

COHEN: Okay, I think you've told us of your London years, and then coming to Washington. Is there anything else you'd like to say? It was ten years that you were there.

TODD: Yes. Well, as I said, this was partly at the time of McCarthy and later on. There were great troubles there.

We enjoyed being there. But I think in our blood we were teachers. And some people had asked me to go here or there. But there were always some objections. The weather was bad—Minnesota is not a good place to go. [Laughter] Somewhere else, they would not do anything for Olga. "Oh, she can teach in a high school." This sort of thing.

Finally, Caltech asked us to come, both of us. So we came here. That was in '57.

COHEN: The place wasn't really that much smaller than now. It hasn't changed in numbers too much. Now, DuBridge would have been the president then.

TODD: Yes, yes.

COHEN: So DuBridge brought you here.

TODD: DuBridge and Bacher and Bohnenblust. And also [Arthur] Erdelyi was here. He came here to edit the Bateman Papers. I had known him. One of the things we did at this Admiralty Computing Center was that there were foreign people there who could not easily be hired, but who could contribute by writing textbooks on subjects which were needed.

COHEN: That was getting around the citizenship requirements.

TODD: Yes. So I arranged for him and other people to write these things, and this more or less freed the citizens who were actually employed for all this classified work. These people could

do it very well.

So Erdelyi then came here and stayed here for quite a long time.

COHEN: And he was a professor in the mathematics department?

TODD: Yes, for a long time. But then he was called back to Edinburgh.

COHEN: Was he Scottish?

TODD: No, Hungarian. But he had been at Edinburgh, and he liked Scotland. This offer from Caltech came to him, and in his office was a famous English mathematician—[Sir Edmund] Whittaker. He said to him, "Young man, you have no future here at Edinburgh. Take the Caltech offer." But then, you see, it turned out finally he became not the successor of Whittaker, but the next one along in succession. So he had his place at Edinburgh now. He died there.

I think Bohnenblust had known Olga briefly at Princeton when she was at Bryn Mawr. And they needed somebody in numerical computation, and that was me.

COHEN: So you moved here in '57. And you were professor, and Olga was a research fellow.

TODD: She was research associate, which they said was the equivalent of a professor. She wouldn't have to do any teaching, but she could teach. And she had some remarkable successes with her students right at the beginning. So in due course, she became professor.

COHEN: You, though, were professor right from the beginning?

TODD: Yes.

COHEN: And the math department was not very big then.

TODD: No. You see, they had lost E. T. Bell, and [Aristotle] Michal, and some of the other people. We had been at UCLA in the previous ten years, off and on—one year full-time—and then probably a month every year. So we knew everybody.

COHEN: Did you buy your home right away when you came? Where did you live?

TODD: We lived in the Athenaeum for eight months. And each evening we went walking around. We wanted to be within walking distance of the campus. And finally, after about eight months, we found the house and we bought it then.

COHEN: So you've been in one place since you came here.

TODD: Yes.

COHEN: Is there anything you'd like to say about being at Caltech? Your students, your courses; how has it been? Evidently, all right, because you've stayed.

TODD: Yes. Well, it was a fight, you see. Nobody wanted computation. And I think people outside didn't want mathematics; I mean, they wanted computation, but not mathematics. [Laughter] So there were some arguments.

COHEN: When they really started seriously with the computer business here, it was in engineering.

TODD: Yes, yes. But I was in PMA [Physics, Math and Astronomy].

COHEN: Did you have any say, when they really got serious about doing the computing?

TODD: Not too much. I mean, I used the machines, I taught the courses.

COHEN: But you weren't involved in the set up.

TODD: Well, there was a time when there was this formation of the applied mathematics group. But it had Herb Keller at that time as a computational expert. And I was in the mathematics faculty. My first courses, on the whole, were essentially for graduate students. Seniors and juniors, of course, could come; but it was a first-year graduate course. And this went on. And

then we had this little second-year course. For instance, Frank Press decided when he was here that all his students in seismology should have two years of computing. But then we found out that there was some trouble, that the students didn't come to the courses who should have come. And then they would come to me, when they got down to do computing and writing their thesis, and wanted me personally to repeat the course. [Laughter]

Then, after more or less developing this first-year or second-year graduate course, even a third year of special topics, I decided that everybody should know [computing]—undergraduates, too. So I started to try to develop two courses: numerical analysis, which I wanted in the third term in the freshman year; and then numerical algebra in the third term in the sophomore year—including matrix theory.

I gave these courses off and on for many years under completely different names. They were called sometimes 1C, or 3A.

COHEN: But they were strictly in the mathematics department. They were not in the applied physics department?

TODD: No, in the mathematics department. And these were quite successful, I think. I wrote these things up in books, as texts for these courses.

COHEN: Now why did you do this?

TODD: Because they felt that computation was something which everybody should know.

COHEN: Would it be a bad thing to say "computation" in a course in mathematics? Would that scare away the students?

TODD: Yes, yes. It should be in mathematics, the basic courses. Things have changed slightly now, with the computers. Now in this new curriculum, I don't know where they are.

COHEN: But now there's a whole department of computer science.

TODD: It's either theoretical or engineering—I mean, more or less, logical or something—and

then the active fabrication of these computers here. That's completely different.

COHEN: So is anybody now teaching the sort of thing that you introduced?

TODD: Well, Herb Keller and some others. But very often, you'll find that everybody wants to teach a course in their own department. As I said, it's probably in some ways a waste, not cost efficient. You can't expect, if I go and teach a course in chemistry or something, that I will teach a mathematical course which is practical enough to apply to chemistry, for example.

I was unsuccessful at getting the mathematicians to integrate the numerical analysis into their courses.

COHEN: You were not successful enough in establishing this basic computing course the way you would have liked it to go?

TODD: Yes. And partly, you see, I feel that if Morgan Ward and H. P. Robertson had lived, this I would have done. They would have helped me. Because I knew them both; I knew Robertson quite well. Olga knew him at Princeton, and I knew him during the war. So I feel, with their support, this would have come about.

Anyway, we were happy enough here.

COHEN: So tell me, did any of your colleagues have some significance? Did you work with any of them while you were here? Did any of them inspire you?

TODD: I don't suppose I had any great contact. I didn't actually write any papers with them. But they didn't write any amongst themselves either. And Bohnenblust only got interested in computing after he retired. He held courses that Dick Dean gave, you see. Olga was quite amazed about this. I mean, I didn't feel that he had the right idea. He liked to demonstrate a problem with the computer, that he could do such and such a thing, and then he would turn a switch and you blew up something a million times or something, and you could see this. But the students didn't do anything; they saw that from the lecture.

One of the things I did push through was that in the computing classes, there were three hours of lectures, two of lab, six hours homework. From the beginning, I got them to put in two

hours practical work. So I think the courses probably still are three-two-six. It was difficult then, because the computers were slower. And I know students don't do their homework until the last day of term. They had to line up in sleeping bags to use the machines. [Laughter]

COHEN: Well, it's a field that has grown so fast.

TODD: Actually, the history of computing at Caltech was a very sad story for a long time. They appointed people who wouldn't talk to mathematicians. I mean, there was a man from I think Denmark or Sweden, these people who were interested in graphics and so forth. And then the fabrication people. And then there's the group, theoretical computer science, which is of little use to the ordinary, practicing scientist; it's really higher logic, you see, and belongs more to mathematics.

COHEN: So this was a developing science. You were in one facet of it.

TODD: Since I was the only one in this area, most of my early students, I let them get a master's degree, and I taught them all I knew. They wouldn't learn any more here, and we sent them to Stanford and other places, where they could meet more people and get a broader education.

COHEN: I suppose in some sense, Caltech is a very small place—although they've certainly gone into the theoretical computer business in a big way.

TODD: I never taught really any of the regular courses—like this Mathematics 1. Well, I did say I'd teach the third term under some disguise. But for a long time, being the only person teaching computing, I couldn't do the regular things.

COHEN: So you taught all the computer-related things.

TODD: Yes, and some of the applied mathematics courses, which were not particularly computer related. They told me, "Don't clutter this up with computing." [Laughter]

COHEN: But aside from all that, you have to say you did enjoy your years at Caltech.

TODD: Well of course I did, yes. We went away, I think, to Vienna for a Fulbright year. This was rather amusing. We didn't know what we were in for. If you had a Fulbright in Vienna, the Fulbright programs elsewhere could invite you. So we arranged to lecture on Mondays. And usually on Tuesdays, we went somewhere else; we went to Israel. [Laughter]

COHEN: So it was a springboard for just travel.

TODD: Yes, just travel. And then came back on Sunday, you see, and gave our lectures. And then went again.

COHEN: In some sense, you were hardly in Vienna; it was just a springboard to go other places. You did that for a whole year?

TODD: No, half a year. That we felt was enough. But it was quite interesting. I went back to Belfast to give a lecture there. And London, Israel, France, Germany. So we saw a lot of Europe.

COHEN: Tell me, what do you do now? Since you're retired, do you continue an interest in your work?

TODD: Yes, I have plenty of problems not solved. Naturally, as one grows older, one gets involved in history.

COHEN: You're doing a lot of writing, is what you're saying?

TODD: Yes. [Laughter] It's curious. I had a student in one of these mysterious courses. I had done a little piece of work. It was just within the compass of the students' reach. So I said, "This is your homework. You don't need to do it; do the other ones." And one of my students did it and broke the back of the problem. So I said, "Let's write a paper about it." So we wrote a paper. And he went to Cornell. I wrote a good recommendation for him. And then I hadn't heard: Did he get his degree? Then I get a letter from him, saying he is coming back for his twenty-fifth reunion, and he wants to thank me for what I did for him.

COHEN: Where had he been all these years?

TODD: Well, he got his degree at Cornell. And he's been in the software industry in Washington, D.C. He's Chinese; I think his name was H. W. Hwang. He's coming to see me next month. [Laughter] He said this was the climax of his career, at Caltech, to have this paper. He had done a good piece of work.