



ZUS (MARIA) HAAGEN-SMIT (1910–2006)

INTERVIEWED BY
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Abstract

This interview in 2000 with Zus (Maria) Haagen-Smit, widow of Caltech biologist Arie Jan Haagen-Smit (1900-1977), describes their early education at the University of Utrecht, his work on terpenes with Leopold Ruzicka, and the cooperation between Caltech and Utrecht in studies of plant hormones. In 1936, as war loomed in Europe, Arie Haagen-Smit was invited for a year to Harvard by Kenneth Thimann; in 1937, he was invited by T. H. Morgan to join the faculty of Caltech's Biology Division, where he continued his work on terpenes and plant hormones. Recollections of Dutch group at Caltech: Frits Went, Herman Dolk, Johannes van Overbeek, and Anthonie van Harreveld. Advent of World War II; opening of butadiene plant in Los Angeles, 1943, and consequent smog problems in Los Angeles. She recalls her husband's pioneering work in analysis of smog and measures to reduce it; and his consultancies with L.A. County Air Pollution Control District, Southern California Edison Co., auto industry, and California Air Resources Board. She reads extensively from Arnold Beckman's tribute to him and the history of Los Angeles County's battle to reduce air pollution. Summarizes the awards and honors he received toward the end of his life.

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Arie Haagen-Smit investigating emissions, October 1956.
Photo by Patterson

California Institute of Technology

Oral History Project

Interview with Zus Haagen-Smit

by Shirley K. Cohen

Pasadena, California

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ZUS HAAGEN-SMIT

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CALIFORNIA INSTITUTE OF TECHNOLOGY
ORAL HISTORY PROJECT

Interview with Zus Haagen-Smit
Pasadena, California

By Shirley K. Cohen

Session 1

March 16, 2000

Session 2

March 20, 2000

Begin Tape 1, Side 1

Cohen: Perhaps you could start by telling us a little bit about your background, your family, and then about Arie's background also.

Haagen-Smit: OK, Shirley. I'd be delighted. I am Zus Haagen-Smit, and "Zus" is a nickname. My real name is Maria, which I don't like. "Zus" is the Dutch for "Sis," and I was always called that in the family. So when I had a choice, in the U.S., to say who I was, I chose "Zus" over "Maria."

If I start with myself, I almost have to start with a little historical background about Holland. Holland was and is still very much a class society. In my family, everybody was geared toward getting a university education, and every family tried to get their children through school to enter the university. My family was very much oriented that way. My father was in classics. He was the principal of our school, where Latin and Greek were major subjects, in addition to mathematics, chemistry, physics, French, English, German, Dutch, history. We had them all. And there was another kind of high school that did not have Latin and Greek, where the final exam excluded you from certain academic pursuits.

Cohen: You mean, you were excluded if you didn't have Latin and Greek?

Haagen-Smit: Yes. But of course, my father being the rector, or principal, of the school, we all went to what was called *Gymnasium*.

Cohen: How big was your family, Zus? How many brothers and sisters?

Haagen-Smit: We were five children; I had two brothers and two sisters. I was the oldest of the girls. There was one brother older than I and one younger. My older brother studied law and became a lawyer. My younger brother, who is still living, is a retired obstetrician/gynecologist. And of the girls, I was the only one who went to the university. Everything to do with nature had always been my hobby, and I became a biologist. Universities in Holland at that time were organized so that there was only one full professor in each subject. So there was one physiology professor in botany and one in zoology. There was one full professor each in comparative anatomy, zoology, embryology, analytical chemistry, inorganic chemistry, and physical chemistry. Now, Arie [Arie Jan Haagen-Smit] was a lot older than I—ten years older. So he already had his doctorate in organic chemistry when I met him.

Cohen: How did you meet him?

Haagen-Smit: At that time, I was working on what you would call a master's degree in physiological botany. We called the botany professor "the old Went." He was the father of Frits Went, who later became a professor of physiology and botany here at Caltech.

Cohen: Ah! So that started your connection.

Haagen-Smit: At that time, botanists had started working on plant growth hormones. Then they found out that they needed help from chemists. That is how Arie got involved with the Botany Department—as a chemist helping to find out what the chemical formulas were of the substances that caused growth in plants.

Cohen: Tell us a little bit about Arie's parents and his growing up.

Haagen-Smit: Arie grew up in Utrecht. His father was the chief chemist of the Netherlands Mint. When Arie and his two sisters were small children, they would go to the mint with their

father, and the mint was stacked with blocks of gold and silver, of which the Dutch coins were made. Arie and his sisters played around those gold and silver blocks—not knowing, of course, about safety, which wasn't much of a concern at that time in Europe. They just played there. So he grew up with chemistry. Then he went to a high school that didn't have Latin and Greek, and when it came time to choose which way he would go in the university, he wanted to go into mathematics. That was his favorite subject. But he was discouraged by everybody he talked to, because there was no work for mathematicians except the one professorship in the university. So he switched to chemistry, because chemists were needed in more places than just the university.

Cohen: Now, if he didn't take Latin and Greek, how did he get into the university?

Haagen-Smit: He didn't need it for chemistry. At that time you needed it only for language and for law, but that has changed now. So he chose physics and he became an organic chemist, because he was not very impressed with inorganic chemistry.

Cohen: Did he do all his university work at Utrecht? Undergraduate and graduate?

Haagen-Smit: Yes. At the time when Arie was working on his doctor's degree, there was still a Dutch professor [P. Van Romburgh], who retired [in 1928] and died soon after that. At that time, Germany and the German-language countries were the domineering countries in physics, chemistry, and mathematics, so the next professor in organic chemistry was Professor [Leopold] Ruzicka, from Zurich. His specialty was terpenes, and he brought with him a whole crew of people who worked on the same subject. So when he became the organic chemistry professor, all the doctoral students went into that same field. So Arie's dissertation is on sesquiterpenes ["Investigations in the Field of Sesquiterpenes," 1929].

Cohen: I see. So there was no choice—you had to work on what that professor was interested in.

Haagen-Smit: Yes. That's what he lectured on and that's what all his students worked on. Well, Ruzicka lasted only two years, and then he went back to Zurich. He was followed by

[Fritz] Kögl, the German. And Kögl came at the time when in botany they had started work on growth hormones. So the Botany Department asked for help from Kögl's organic chemistry [group].

Cohen: Now, Zus, this would have been in the early thirties?

Haagen-Smit: Yes.

Cohen: Can you give a little more background, Zus, about all the people who went away while you were there?

Haagen-Smit: Well, when I became a student in botany in Utrecht, there already was a whole school of students who were following the interests of their major professor in physiology and botany, which was Professor Went. We called him "the old Went," because his oldest son, Frits Went, got his doctorate in biology under him. Frits then went to Indonesia, which was at the time a Dutch colony. And most of the biologists who graduated from Utrecht and got their doctor's degrees in biology—especially in botany—almost all of them went to agricultural research stations in Indonesia. At that time, there was a research station there in what was then called Buitenzorg but now is called Bogor. That whole research station was manned by Dutch botanists. When I started out as a student in Utrecht, Frits Went had already gone to Indonesia. But he had started work, under his father's tutelage, on the hormones that were involved with plant growth, and he continued that work. And the work also continued in Utrecht, with different people. And then at a certain point, they felt a need for organic chemistry help, because they wanted to try to find out what components caused plants to grow and to bend toward the light. So they approached Professor Kögl and asked him for assistance. And that is how I met Arie, who was not a botanist but an organic chemist. He got involved with the program in the Botany Department in Utrecht to try to find out what the chemical components were that make plants do what they are doing. He was working with a group of organic chemists in organic chemistry, but the testing of those chemicals was done on plants in the Botany Department.

Cohen: Arie already had his PhD at this point?

Haagen-Smit: Oh, yes. He was the chief assistant to the professor. That was as high as you could get. Professor Kögl was only, I think, four or five years older than Arie, so Arie had to wait until Professor Kögl died or left for somewhere else, or he would have no opportunity in Holland to progress.

So he worked on the chemicals with the group. Most of them were Germans who came with the professor.

Cohen: And that was customary?

Haagen-Smit: Yes. He brought his own group along, and the whole group worked together on what he wanted them to work on. They worked night and day and came up with chemical formulas and tested them. The way of testing, at the time when I got involved, was that we worked in a dark room with a minimum of light. And we had little seedlings of *Avena*, which is oats, maybe an inch tall. We would cut off half of the top and put that chemical on the cut-off half. And if you had the growth hormone, the other half would bend in that direction trying to get some of that growth hormone. So that was the test. We worked with about a dozen people sitting around a table—

Cohen: Now, Zus, was this a job for you?

Haagen-Smit: No. That was just volunteer work. I was glad to be in on it. The professor's wife worked among us. I have photographs of it. We tested those things. Nowadays they would have Beckman Instruments and spectrographs to do these things, but at that time it had to be done with chemical workups, trying to get closer to a correct formula of the substance that would cause that. So it was of major importance. Years and years of work went into it.

How Dr. Thomas Hunt Morgan, as a geneticist, got into that subject, I don't know. But after he came to Caltech in 1928 one of his first Dutch connections was Herman Dolk, who perished after a few years. He died during one of their camping trips in the desert, when he hit the soft shoulder of the road and the car overturned. He was one of the first Dutch people here. Then Frits Went, who was in Indonesia and already had been working on that subject, was asked

to come to Caltech, because Dr. Morgan was trying to work up a group of biologists of reputation in that field. Dolk was still alive when Frits came.

Cohen: Dolk was also from Holland?

Haagen-Smit: Yes. Herman Dolk was from Holland.

Cohen: Did you know him there?

Haagen-Smit: No, I didn't.

Cohen: Did Arie know him?

Haagen-Smit: I think he probably did, but I don't know. And then some people from the Biology Division here at Caltech who were working under Dr. Morgan came to Holland—to Utrecht—to join in this effort. And one of them was Kenneth Thimann. [That was] very important, because he was the one Arie worked with when we came over to Harvard that first year.

Cohen: So Arie had met him when Thimann came to Utrecht?

Haagen-Smit: Yes. Another one who came was James Bonner. Arie and James were rather critical of each other. I remember once giving a seminar where Arie had kind of coached me what to say. James didn't like it very much, and there was rather some friction between the two of them about it. But anyway, after Kenneth Thimann and James Bonner had been in Utrecht for some time and gotten involved in this work on the growth hormones, Arie was asked by Harvard to come. So I got involved with that project.

Cohen: Now, you already had your master's degree?

Haagen-Smit: Well, let's call it a master's degree. The whole arrangement of the educational system was different. I was working on that. There was another connection [between myself and Arie]. Arie was very much of an athlete. Again, Holland—and Europe generally—was very much a class society. The students were divided according to whether they belonged to a certain group—students who could afford to belong to it, and students who could not afford to be in it. The students who were in the upper group had gay festivities and were very important in sports. They had a rowing competition. The upper group had competitions in all kinds of sports that the other group just didn't participate in. Arie belonged to the student corps and they were competing, for example, in rowing.

Cohen: Arie belonged to this upper group?

Haagen-Smit: Yes.

Cohen: And you did, too?

Haagen-Smit: No, the girls were not involved in that student group at all. We had our separate women's student group. But Arie's group had competitions with the other universities in Holland, of which there were only five then. There was Groningen, Utrecht, Amsterdam, Delft—that was the only technical one; now there are three or four or five—and Leiden, and they competed in those sports. Those were the big events. Now, sometimes you see pictures of the Harvard crews—the eights, the fours, the single ones, the skiffs. Well, at Utrecht these crews would use the canal that connected the Rhine River with Amsterdam—a huge canal. We rowed there, with the freight ships—we had to be careful of them. There was a civilian rowing club that was mixed, women and men, and I belonged to that. After Arie was through with his doctorate, he wasn't eligible anymore to be in the student rowing group, so he switched over to the civilian rowing group.

Cohen: And that's where you met him.

Haagen-Smit: That's where we became acquainted. At that time, I had a cousin who was a medical student in Utrecht who did not belong to that exclusive student corps, but he also rowed in the civilian rowing club. Arie coached my cousin and his partner in that very narrow boat, and I was the person who steered the boat. Arie was riding his bicycle on the road alongside the canal, coaching this rowing group. They also had competitions—but not in the student group that had the big competitions. So that was another connection between us; it wasn't just in the laboratory, it was also the rowing. We did a lot of that.

Arie was married at the time. I didn't know his wife. She was a pharmacist, so when he was a chemistry student, she was in the same classes as he. The chemists and the pharmacists did the same course work. They had a son, who is now my stepson. His wife had lung cancer and died when her little boy was three months old.

Cohen: Sad.

Haagen-Smit: Sad. At that time, he was already coaching my cousin and his partner. So after his wife's death, he had to find a way for his little son—his little baby—to be taken care of. There was a woman biologist of his age who was divorced and had a daughter. She had quit her biology education because she divorced, so she was just a mother of her own little girl, and she took Arie and his little three- or four-month-old boy into her house, where they lived as boarders. I was living in a house nearby. See, lots of people in Utrecht made an extra living by renting rooms to students, so I had a room in a house where several other students lived. After a while, Arie and I got engaged. And since he, of course, had a little boy—whom I also knew; I was over there all the time visiting—fairly soon after that, we got married. That was in 1935. When we got married, Jan Willem was just short of two years old, and I took over as his mother. The little boy had two names—Jan Willem, we always called him that. Most people call him Jan now, but I still call him Jan Willem. We lived in a small house on the outskirts that we rented. In Holland very few people owned their houses; everybody rented. So we established a home there. Jan Willem never knew his own mother, of course. He was too little when she died.

We married in June 1935, and of course Hitler had started the upheavals in Germany in 1933. This was not taken at all seriously by my family. They said, "Oh, the Germans will never go for that crazy idiot." My father was absolutely convinced that Hitler would be thrown out in

no time at all. But he wasn't, of course. We very much blamed France and England—that they allowed Hitler to make his first move, which was crossing the Rhine. Hitler had nothing. His troops had one shot available to them. And if they met any resistance, the order was to turn back. But the French and English didn't want to lift even that one finger. They let him go ahead, so he crossed the Rhine and took over on the west side. That was his first success, and that emboldened the Nazis, of course. Next they went into the German part of Czechoslovakia. They took over there, without anybody lifting a finger to stop them. Then they went into Austria, which was very German anyway. They were heroes in Austria. We saw at least the beginnings of the serious threat in Europe. And then came the offer from Harvard for Arie to go for a year as a visiting lecturer. Of course, we saw Europe going the wrong way, and it also was an opportunity for Arie. He was chief assistant at Utrecht, and that was as far as he could go in the university.

Cohen: Now, were you still working, or were you just taking care of the child?

Haagen-Smit: I was only a housewife and mother for Jan Willem. I had quit totally.

Cohen: OK. But that would have been the custom?

Haagen-Smit: Yes. And it wasn't easy to get a visa. We had to fight our way through a lot of paperwork and recommendations to even be allowed to come to America for a year.

Cohen: But this was the chairman? This was Kenneth Thimann who invited you?

Haagen-Smit: Well, he was the main force who brought Arie over to Harvard. He was working on these plant hormones, and he was closely connected with Utrecht on that. So we came. We were paid—both in Holland and at Harvard—very little money, so we were extremely frugal. It is hard to describe without going into the history of how things were at that time.

Cohen: So you just took a leave from Holland?

Haagen-Smit: Yes. Arie took a leave for a year, and we lived at Harvard. Arie was working on another biology-connected subject, not so much on the growth hormones. There was a bacterium that was in a cyst, and at a certain point a chemical was involved to make it come out of its cyst, and that's what he was working on. The bacterium grew in hay, so he had enormous quantities of hay in the basement of one of the botany buildings where he worked at Harvard. We had come over in the fall of '36, more or less only knowing the Thimanns, and they had rented an apartment for us.

Cohen: Without sunshine? [Laughter]

Haagen-Smit: Without any sunshine, because I didn't know of the existence of elevators in buildings. Where I grew up, there were no elevators, because there were no tall buildings. Even in Amsterdam, in the old houses that were high enough—three or four stories high—you walked up the stairs. So, since I was expecting a baby, I had asked for an apartment on the first floor, so that I could go out with the baby in a baby carriage. And that meant that I was in a tall building on the first floor, where the sun never came in. I was pretty miserable there. It was close to Harvard, because Arie had to go to work. Of course, no cars, no bicycle—he had to walk. So that is where we spent that first year. Then, before that year was up, Morgan had started the group that studied the plant hormones here at Caltech. And before that first year was over, Arie got an offer from Dr. Morgan to come and join the group—among them Frits Went and James Bonner, the group working on the plant hormones that Arie had been working on with, among others, Bonner in Holland. And by that time things in Europe had of course gotten worse and worse, so we were only too glad to accept the offer to come to California. And we did, with Jan Willem, who was just three years old, and a baby, who was ten months old.

Cohen: What position did he come for?

Haagen-Smit: Visiting lecturer was the position at Harvard. I imagine he was offered an assistant professorship here at Caltech. That would be the normal expectation.

Cohen: Had he visited Caltech?

Haagen-Smit: No, no. He knew nothing but Harvard. Cambridge and the little, narrow surroundings of Cambridge were all we knew. Finally, in the spring, we had saved enough money to buy ourselves a car. It was a new convertible Ford—bright red. I remember it as costing \$700 or \$750. And since Arie was occupied all day, I was going to be the first one to learn to drive, and I did. But by the time summer came, Arie also knew how to drive. We had accepted the position at Caltech, so we were going to drive across America, from Cambridge to Pasadena, and we did. But being total novices at driving, it took us exactly three weeks.

Cohen: Because you wanted to see something on the way?

Haagen-Smit: Yes. And there were very few hotels, and even fewer motels that we could afford. There were no disposable diapers, so we tried to stop in a motel no later than four o'clock so that I had time to wash diapers for the next day. And we tried to see some of the country. I had a whole stack of postcards, because we had no camera. So when we came into beautiful country, I bought postcards. I just recently found them, trying to move things out of this house. And there was one postcard that I had written to my parents and apparently, for some reason, did not mail. There I wrote that we were in the Black Hills, that it was my birthday, that we had taken a nice motel for once to celebrate, and that we were going to Yellowstone the next day. I had lots of postcards from Yellowstone. Of course, we were in beautiful country. We went to Bryce—it's the only time I have been there in my life—and to Zion. I think that was all. Of course we came through an awful lot of deserted country. I remember a postcard that I wrote when we were in the Dakotas. In September, of course, it was a desert of nothing but dried-up vegetation and locusts. Our radiator would be covered with locusts. As far as you could see, there was no tree in sight. I said that I had never seen anything as terrible-looking as that kind of country. And then, of course, before we crossed the mountains into California, we went through the desert again. But when we came through the Cajon Pass, we had California in front of us, all orange groves and green and lush.

Cohen: Did you think you were in heaven?

Haagen-Smit: Yes.

Cohen: You were lucky you had no car trouble. The roads were not so good then.

Haagen-Smit: No, they were not so good, but we managed one way or another. I remember that one of our last stops—I'm pretty sure I'm correct—was in Beaver, Utah, which is close to the Nevada-Utah border. By that time we felt we could splurge a little. We had a motel with a swimming pool; that was really splurging for us.

Then we came to California and were met by the Wents. They had found an apartment for us close by Caltech and near where they were living. There were at that time other Dutch people already in Went's group. Now, I don't know exactly who followed when, but there was Johannes van Overbeek—Hans, we called him. He was here for years. And then they branched out to zoology. There was Cornelis Wiersma, who came with his assistant, Anthonie van Harreveld. You might still remember their names.

Cohen: So it was really a Dutch Mafia, as we would say.

Haagen-Smit: Near the end there were five Dutch professors.

Cohen: Went and Arie and Overbeek and Wiersma and Harreveld.

Haagen-Smit: Yes. We were quite a big Dutch group here at that time. And we all came from Utrecht. Arie did. Van Overbeek came from Went's group, from Utrecht. [Tape ends]

Begin Tape 1, Side 2

Haagen-Smit: In Holland we had lived a kind of life [in which] I didn't even know there was a Depression. My parents didn't talk about these kinds of things. But at that time, either voluntarily or involuntarily, Caltech had lowered salaries in order to be able to survive. We were here on a very low salary and had two children. Have you ever heard the name [Theodosius]

Dobzhansky? He was a very famous Russian geneticist. They lived across the street from us. Do you know the name [Henry] Borsook?

Cohen: Oh, of course.

Haagen-Smit: Well, they lived on the next street over, which is now a parking lot.

Cohen: Also Dutch?

Haagen-Smit: No, Borsook was American. The connection was mostly the children. The children played with each other; they had a daughter, Eva Borsook, who was a little older than our children. And right across from us—from our building, which is now a parking lot—there was Natasha Dobzhansky, who had a little girl who was about the same age as our children. The children, including the Went children, played together. And Hans van Overbeek lived out where Caltech had a farm, which is now Temple City High School. He had corn growing there—a big field of corn. When Hans worked there, he wore wooden shoes, which he gave to me.

Cohen: This was a Caltech field?

Haagen-Smit: Yes, it belonged to Caltech. Hans had an Indonesian wife.

Cohen: Had many of these people been to Indonesia, like Went?

Haagen-Smit: Frits Went had been in Indonesia. Anneke, his daughter, was born in Indonesia. When they came to Caltech, Anneke was two years old. Of course, I didn't know them at that time.

Cohen: What language did you speak [with each other]?

Haagen-Smit: Dutch. There's only one Dutch person left now—not of this group. That's Trudy Luxemburg. The Luxemburgs are Dutch.

Cohen: So you and the children spoke Dutch?

Haagen-Smit: Well, pretty soon there was a nursery school right across from the entrance to Kerckhoff, where Arie, Frits, Wiersma, and van Harreveld had their offices. Mrs. Tyson, whose son was either a student or something else at Caltech, ran it. She had a nursery school where all these diverse children went each morning.

Cohen: Was Kerckhoff called the Dutch building?

Haagen-Smit: There were a lot of Dutch. Arie once said that he could walk from Kerckhoff to the Athenaeum speaking nothing but Dutch, because so many of the janitors were Dutch, because they had fled from Indonesia. That's why there are so many Indonesians here. All those who had either adopted Christianity or had a half-blood Dutch wife were kicked out of Indonesia, and a lot of them came to America. A lot of them came to California, where they liked the climate. A lot of them went to Houston, because Royal Dutch Shell had its headquarters there. In Houston you will find shops where they have all the Dutch products, because, just like here, there are so many Indonesians.

Cohen: Now, weren't there also some Dutch farmers in Chino, in that area?

Haagen-Smit: Yes, but they were there earlier. That had nothing to do with us. Holland is, of course, a very small country. Long ago, they settled New York as New Amsterdam, and lots of them found places. Partly because of religious intolerance, the Puritans came from England to Leiden, and from Leiden they went to Plymouth. They sailed to Plymouth. Holland had—

Cohen: Always had received these people.

Haagen-Smit: Yes. But Holland also had very Calvinistic and orthodox places. The settlements in Chino were Friesian cattle farmers. That was a different group. They were not the university people we grew up with.

Cohen: That was that other class you were talking about.

Haagen-Smit: Yes.

Cohen: So tell me, did Arie continue his work on the growth hormones?

Haagen-Smit: Yes. He worked partly on the growth hormones, but he also picked up his work on the terpenes again, which are all the flavor components of any plants. That was his main subject, but he also worked with Frits Went on the plant hormones. While working on the terpenes, he had a whole group of people, some of them European. Peter Lowy was a Jewish-Austrian refugee; he died only a few years ago. He also had a Hungarian—Elizabeth Roboz, she was Hungarian and Jewish. He had quite a number of refugees. Does the name [Laszlo] Zechmeister mean anything to you?

Cohen: Sure. I remember that.

Haagen-Smit: A Hungarian refugee.

Cohen: I remember that she [Elizabeth Zechmeister] used to come to the swimming pool.

Haagen-Smit: Yes. She's dead now.

Cohen: So these are people that Arie worked with here?

Haagen-Smit: Yes. And Miss Roboz later married the son of Einstein [Hans Albert Einstein], in Berkeley. A complicated story. But anyway, Arie had a whole group working on microchemical things, which nobody else did in the chemistry division at Caltech. Then, during the early years of the war—of course America came into the war in December of '41—they started, more or less from scratch, building up the armed forces.

Cohen: Had you become citizens at this time?

Haagen-Smit: Arie was a citizen before I was. Both of us [became citizens] in the forties. We lost contact with Holland, but not until the Japanese attacked America. Holland had been conquered by the Germans in less than five days. Holland had what they thought was a very good defense line. They flooded the area between Amsterdam and the Rhine, which was built to be flooded, so nobody could get across. But the Germans did—they parachuted across. They took The Hague. They bombed Rotterdam flat. And that was the end of Holland. The flood didn't help a bit—just like the Maginot Line in France. They just went over it, or around it. In France they went around it. In Holland they flew over it and dropped parachutes. Nobody had any idea what was coming, and so Holland was conquered in May 1940. America didn't get into the war until December 1941, almost a year and a half later. Indonesia was taken by the Japanese early in 1942. Right after Pearl Harbor, the Japanese took the whole of Southeast Asia.

Cohen: So your concern was now in Indonesia, because you knew so many people that went to work there.

Haagen-Smit: Among them, my sister lived there with her family. They lived in Sumatra. So Holland had contact with America during the year and a half, but not with Indonesia. So a lot of Dutch people used us to send letters to people in Indonesia.

Cohen: They sent them through you?

Haagen-Smit: Yes, because we still had contact for that year and a half. [These were] people that I didn't know at all. Some were English. They just asked, "Would you please send this letter?" I still have some of them.

Cohen: It must have been a very anxious time.

Haagen-Smit: Oh, it was. And then, of course, after Pearl Harbor we had no contact with Holland until the liberation in May of 1945. Of course, we followed the news as well as we

could, but I had only two Red Cross messages during those four years from my father—just a few words. One was to announce the marriage of my sister and one was a notice of a birth of a grandchild. That was all we knew. And from Indonesia we didn't know a thing.

The Germans were very smart in their occupation. For example, when they had Holland, they didn't do anything right away. Then in the small town where I grew up, the first thing they did, which sounded very innocent, was to have all the citizens register. They had everybody's address. They picked out the Jews, identified who was this, who was that. Nobody thought anything about it. Everybody registered. The Japanese did the same thing in Indonesia. They did not have the personnel to take all the Dutch and important people prisoner, so they started very slowly—it took a couple months—taking the men first. They put the men in prison camps and left the women and children alone for a while. Then they started putting the women and children [in prison camp]. The children could stay with their mothers until they were thirteen years old. Then they went to the men's camps.

Cohen: Thirteen?

Haagen-Smit: Thirteen. I think I'm right. It might have been fourteen, but I think it was thirteen. My sister had three little girls. Of course, we didn't know what was going on until much later. In a way, the men's camps in Indonesia were better than the women's camp, because the men were almost all academic people. They were the people who had manned the research stations—the chemists, the biologists. They knew how to grow things: yeast vitamin, snails. They knew a lot of things. The prison guards depended on those knowledgeable Dutch people. But the women, of course, didn't have that knowledge, almost none of them.

This is a digression from Arie's story, of course, because we had nothing to do with it—we didn't know a thing. The regular work went on in Kerckhoff, where Arie worked. Then, when America got involved in the war and had to start building up its armaments, they needed synthetic rubber, because the natural rubber from Southeast Asia was cut off. So in 1943 they built a butadiene plant in the middle of Los Angeles—butadiene is necessary for making synthetic rubber. And that was the beginning of the smog, because the minute that that factory was fully in action, there were orange-brown clouds that irritated noses, ears, eyes. People could hardly live in that neighborhood anymore. They said they couldn't live that way. That was the

beginning of the big battle—what to do about it. Of course, there had been chemical things going on before that, but nothing that caused any trouble. So they called in someone from Pittsburgh, which had its problems.

Cohen: Bad air, yes.

Haagen-Smit: And the fellow that was responsible for analyzing Pittsburgh's bad air came over and said it was soot from the coal in Pittsburgh that caused it. That was the only thing he knew. Coal—that was the culprit. Well, of course, it wasn't the culprit. Then they called in somebody else from the East who was from St. Louis, I think. And I don't know what the industry was in St. Louis, but you'd have smog there. He said it was caused by SO₂—sulfur dioxide. That was the culprit. So they started working on that. And they appointed somebody—

Cohen: Who's "they," Zus. The people from the factory?

Haagen-Smit: No. Probably the city government or a group of concerned citizens.

Cohen: So we continue with this problem of smog.

Haagen-Smit: OK. Here are the remarks that Dr. [Arnold] Beckman made when Caltech was awarded the John and Alice Tyler Award in honor of Arie's memory. Dr. Beckman gave the dinner talk. He says that it is a pleasure for him that Caltech got the honor. By the way, Arie had also gotten the Tyler Award [1974]; he shared it with two others [G. Evelyn Hutchinson and Maurice Strong] some years before.

OK, so now Dr. Beckman said that he came as a graduate student in chemistry in 1923. [Reads] "*After receiving my doctorate [at Caltech]*"—

Cohen: Now you're quoting from Dr. Beckman?

Haagen-Smit: Yes. [Reads]

“...I served on the chemistry faculty for several years and have been a member of the board of trustees since 1953. I mention these personal biographical facts only to show that I have had extensive first-hand experience at Caltech in several capacities, so I feel that I can speak with considerable authority when I say that Mrs. Tyler at Pepperdine University and members of the award committee should be congratulated for their excellent judgment in selecting the California Institute of Technology as the recipient for this year’s award. Unquestionably the \$150,000 award to Caltech will be utilized wisely in the interest of science and mankind.”

Then he goes on. [Reads:]

“Caltech was the scientific home of Dr. Haagen-Smit during his air pollution years. It is also currently the home of an active group of scientists and engineers who are continuing the work pioneered by Dr. Haagen-Smit in studying the causes of environmental pollution and searching for ways to control it within acceptable limits and at acceptable costs.” That’s important. [Reads:] *“This group comprises the staff of Caltech’s Environmental Quality Laboratory. Dr. Haagen-Smit came to Caltech in 1937. Born in Holland in 1900, he did both his undergraduate and graduate work at the University of Utrecht. From 1929, when he was awarded his PhD degree, until 1934, he remained on the university’s faculty. He came to Harvard University in 1936, and a year later, at the urging of Caltech’s famous geneticist, Thomas Hunt Morgan, he joined the Caltech Biology Division.”* All that I already told you.

[Reads:] *“In the course of his research in plant physiology, Dr. Haagen-Smit developed great expertise in microchemical analysis. It was this special skill that brought him to my attention. It was also directly responsible for getting him enmeshed in the entanglements of air pollution. It was my good fortune to get to know Dr. Haagen-Smit very well. We worked together closely in the early days of the Los Angeles Air Pollution Control District. My respect and affection for him grew steadily. He was a great person. He had not only a brilliant mind, but also absolute integrity and a delightful sense of humor that endeared him to all of us associated with him in those hectic early days.”*

That was it. It was so hectic. [Reads:] *“Soon it was not Dr. Haagen-Smit, except for formal occasions, but Arie—or more often Haagy, the nickname most commonly used. Dr. Haagen-Smit has been widely acclaimed, and justifiably so, for his many contributions to the fundamental understanding of photochemical air pollution. He has been called the ‘Father of*

Photochemical Smog. With his characteristic humor, his reply to the charge was ‘Who’s the mother?’”

I’ll read this, because it does give you an idea of how it was in those days. [Reads:] “*In these days of multibillion-dollar budgets for the Environmental Protection Agency and huge pollution-control bureaucracies at federal and state levels, controls of auto exhaust emissions and industrial pollutants are accepted without question. They are simply part of our way of life. I wonder whether the current generation of environmentalists and air-control devotees has any idea of how vastly different the situation was thirty years ago, when Dr. Haagen-Smit did his pioneering work. At that time, there was great confusion and uncertainty over the causes of smog and what should be done to eliminate it, much legal and political snarling, frenzied exhortations by innumerable citizens’ groups demanding an immediate cure for smog.*”

It was just hectic. [Reads:] “*I have read many accounts of Haagy’s activities, but I have yet to find one that adequately portrays that period and calls attention to his great patience in dealing with the many frustrations he encountered. Haagy was not only a man of great patience; he was also a man of great courage, who was never afraid to meet head-on anyone who challenged the validity of his scientific work. In the many accounts of Haagy’s life that I have read, strangely one important point seems to have been overlooked. Why did Dr. Haagen-Smit, a brilliant young biochemist, facing a bright future in an exciting field of research, decide to abandon his research and engage instead in the nasty, unglamorous, inglorious field of air pollution? I can shed some light on this question, for I was responsible in some measure for getting him into the act. It may be of interest to review briefly some events that led to this drastic change in his life. Before the early 1940s, there was little public concern over atmospheric pollution in the Los Angeles area. Pasadenans told visitors [of this problem] proudly: ‘On a clear day you can see Catalina.’”*

Cohen: Well, sometimes you can.

Haagen-Smit: Yes, you still do. Again, there were years that you couldn’t. [Reads:] “*The number of clear days became increasingly rare, but no one seemed greatly concerned. Then on September 8, 1943, a crisis suddenly arose. The Southern California Gas Company had built a plant at Aliso Street, near downtown Los Angeles, for the production of butadiene, a chemical*

essential for the production of synthetic rubber and vital to the war effort. When the plant went on-stream that day, vast amounts of noxious fumes were released into the atmosphere, irritating fumes that brought tears to the eyes and caused coughing. The pollution was so bad that people in downtown office buildings were sent home from work.

[Laughter] I didn't remember that! [Reads:] *"Citizens were now suddenly aroused, and their angry protests actually forced the shutdown of the plant, despite the urgent war need for butadiene. Stimulated by this crisis, air pollution control activity heightened. Many official and nonofficial committees were established."*

That's when the problem went from one, to the other, to the other, to the other. [Reads:] *"Many nuisance ordinances were adopted. One major obstacle to effective air pollution control, however, was the fact that within Los Angeles County there were some forty-five incorporated cities."*

Cohen: That's right. There was no one place.

Haagen-Smit: There was no one place. [Reads:] *"The county had no authority to exercise police power in the incorporated areas, where much of the air pollution originated. The City of Vernon, for example, which had an oil refinery, steel mills, and other heavy industries, and was completely surrounded by the City of Los Angeles, could and did figuratively thumb its nose at Los Angeles City and County."*

They were just not going to do it. [Laughter] It was very simple then. Forty-five, there were, and later there were even more. We were all independent. [Reads:] *"During this hectic period, help was sought from experts who reputedly had successfully handled major air pollution problems elsewhere. Dr. Edward Weidlein"—whose name I didn't remember—"head of Mellon Institute in Pittsburgh, PA, and widely credited with cleaning up air pollution in that city, came to Los Angeles, as did members of the Bureau of Mines who had worked with him. They were of no help. According to their own tests, which measured chiefly soot and SO₂, Los Angeles' polluted air was cleaner than Pittsburgh's purified air! They were baffled. The Los Angeles Times brought on Professor Raymond Tucker, air pollution expert from Washington University in St. Louis. He was largely credited with cleaning up St. Louis's smoke problem. After two*

weeks of investigation, he recommended discontinuing the use of backyard incinerators. Strangely, however, he absolved automobiles as significant contributors to local air pollution.”

So they were not any further—well, they did ban incinerators, which helped—here, locally, at least. [Reads:] *“Ultimately, backyard incinerators were banned, despite vigorous opposition from homeowners and incinerator manufacturers, who were forced out of business. Ironically, the banning of the incinerators came about not because of air pollution but because of fire hazard.”*

[Laughter] I didn’t remember that. [Reads:] *“Fire departments blamed incinerators for heavy fire losses...”*

Cohen: That makes sense.

Haagen-Smit: Yes. [Reads:] *“...and predicated substantial fire insurance savings if they were banned.”* [Laughter] I didn’t remember that that was the reason.

[Reads:] *“Unfortunately, even after backyard incinerators were gone, air pollution continued. A major breakthrough occurred in 1947, when Assembly Bill 1 was introduced in the state legislature by Assemblyman A. I. Stewart of Pasadena. This bill, among other things, gave county supervisors authority to establish county-wide air pollution control districts...”*

That’s what finally brought them together in September of ’47. [Reads:] *“...with police power to enforce air pollution regulations within incorporated cities as well as in the unincorporated areas. This bill was signed into law by Governor Earl Warren on June 10, 1947.”*

So then they had control over everything. [Reads:] *“This was a very important measure, because for the first time county supervisors could mount an effective pollution clean-up campaign. And the Los Angeles County Air Pollution Control District was formed, and on October 14, 1947, Dr. Lewis C. McCabe, a fellow chemical-engineering alumnus from the University of Illinois, was appointed director.”* That’s where Beckman, apparently, got his degree.

Cohen: A schoolmate of his?

Haagen-Smit: Yes, and he was appointed director. [Reads:] *“Air pollution didn’t vanish. News media, undaunted by lack of substantial knowledge about air pollution, became almost hysterical as headlines demanded abolition of the ‘deadly sulfurous fumes.’ They took it for granted SO₂ was the chemical villain responsible for haze and for eye irritation. There was some justification for this view, for in Pittsburgh and St. Louis the air pollution villains were indeed soot and SO₂. As there was no soot in the Los Angeles area, obviously SO₂ must be the obnoxious pollutant. It was well known, of course, that SO₂ does in fact cause eye irritation and coughing. Amateur scientists also pointed a damning finger at SO₂. They noted that SO₂ can be oxidized to SO₃, a substance that chemistry texts stated readily formed stable aerosol particles. Haze, of course, is caused by aerosol particles in the atmosphere. There can be no doubt, they theorized, that the SO₃ aerosols obviously are the cause of our haze.”* In nylon stockings there would suddenly fall holes. Do you remember that?

Cohen: Oh, sure, sure.

Haagen-Smit: [Reads:] *“Nylon stockings provided additional damning evidence for SO₃, according to some. They were new then, and small holes and runs were frequently experienced. It’s well-known that SO₃ reacts with water to form strongly corrosive sulfuric acid; it was suggested that the nylon stocking damage was caused by SO₃ particles. So, rightly or wrongly, they believed that sulfur dioxide was the major air pollutant. Dr. McCabe set out on a campaign to reduce dust, smoke, fumes, and sulfur dioxide. I happened to be chairman of the scientific committee of the Los Angeles Chamber of Commerce at the time. I did not believe that SO₂ was a significant factor in Los Angeles’ air pollution. From my chemical engineering training, I knew well the characteristic pungent smell of SO₂, and I knew that the human nose can detect SO₂ at extremely small concentrations. I did not smell SO₂ in the air, and was therefore reluctant to believe that it was responsible for Los Angeles smog.”*

Cohen: You can certainly smell SO₂.

Haagen-Smit: Yes. Right. Like rotten eggs. [Reads:] *“Dr. Robert Vivian, head of the Chemistry Department of the University of Southern California, and also a member of the*

Chamber Scientific Committee, shared my views. We visited Dr. McCabe, expressed our doubts about the advisability of embarking on a major effort to clean up atmospheric pollutants before knowing what they were, and we urged him to do a little research, which would include an analysis of polluted air.”

That’s where Arie comes in. [Reads:] *“The poor chap”—that’s Dr. McCabe—“was being harassed from all sides. Industry said that he was being too tough and unreasonable. Others accused him of being not tough enough. Mr. William Jeffers, who had recently retired as president of Union Pacific Railroad and was chairman of the Citizens’ Smog Advisory Committee, blasted McCabe in the press: ‘What’s the matter with McCabe?’ he asked. ‘He’s been on the job for three months, and pollution is just as bad as ever!’ [Laughter] Dr. McCabe’s reply to our request was, ‘There’s no time for research.’ Eventually we persuaded him that an analysis of polluted air was essential. This is the point at which Dr. Haagen-Smit entered the scene. Obviously, a highly skilled microchemist was needed. Dr. Haagen-Smit was asked whether he would perform the analysis, and he kindly agreed to do it.”*

Arie was working on the flavors of pineapple at the time, and that was all microchemistry. He had been condensing fumes from the pineapple to make a very small volume in order to do a chemical analysis on it. So he had that set up. [Reads:] *“To obtain a sample for analysis, a large volume of air was passed through a trap chilled with liquid air. Along with frozen water vapor, a couple drops of dark brown”—this is now what he got from the air, not from the pineapple—“vile smelling liquid were obtained. After analysis, Dr. Haagen-Smit concluded that peroxy-organic substances were a major source of eye irritation in our polluted atmosphere. This conclusion produced impassioned outbursts of protests, especially from the oil companies and the auto manufacturers. Haagen-Smit was all wet, they said. Obviously much more had to be done. Haagy did not wish to spend more time on the matter, for he had his research program to carry out.”* That was the pineapple program.

[Reads:] *“Furthermore, the situation was taking on nasty political overtones. Pasadena Mayor Warren Dorn accused Supervisor Roger Jessup of ineptitude and worse, and ran a campaign to replace him. ‘Elect me and I’ll get rid of smog,’ he promised. He was elected. Unfortunately, as so often is the case, he failed to deliver on his campaign promises. I was reluctant to pressure Dr. Haagen-Smit very hard, for my conscience bothered me some. If I persuaded him to spend more time on air pollution matters, would I be guilty of interfering with*

his personal research programs, which quite possibly might lead to a Nobel Prize? Fortunately, that dilemma was solved by Haagy himself.”

And now comes why Arie really did go into it. [Reads:] *“One of the outspoken critics of Dr. Haagen-Smit’s work was the Stanford Research Institute, which was doing work for an association of western oil and gas producers. It happened that a member of the SRI staff was to give a talk on air pollution in the chemistry lecture hall at Caltech. I got Haagy to attend with me. After the speaker had described some of his own work, he attempted to discredit Dr. Haagen-Smit’s work, saying that Haagy’s research was not consistent with the SRI’s findings, and expressed regret that a respected scientist such as Dr. Haagen-Smit could make such a serious mistake. Well, I could almost feel Haagy’s blood pressure rise. He was furious. The validity of his work was being questioned! ‘I’ll show them who’s right and who’s wrong,’ he muttered as we left the room.”* He had such trouble with that Stanford Research Institute!

Cohen: So that piqued his interest.

Haagen-Smit: He was so mad! Oh, he was furious! So he was going to prove to them that they were wrong. So that was the connection with [Arnold] Beckman. [Reads:] *“That was the turning point in his career. He decided to take a leave of absence to do more work on air pollution, to squelch his critics and to prove beyond doubt the authenticity”*—

Cohen: So he actually took a leave of absence from Caltech?

Haagen-Smit: Yes, apparently. I didn’t remember that he did. Later on, he took another leave of absence and worked for the Southern California Edison Company [1957], because they were burning oil [for their electric power plants]. And they now are allowed to burn oil only in the non-smog season, and for the rest [of the year] they burn gas. They were very cooperative. [Reads:] *“We all know the consequences of that decision. He painstakingly delineated the photochemical process by which organic materials in the air—mostly hydrocarbons—are oxidized through the combined actions of oxides of nitrogen and sunlight to become smog.”*

Cohen: And that made the smog?

Haagen-Smit: Yes. [Reads:] *“He introduced a wholly new concept of air pollution that brought about a revolution in efforts to obtain clean air. He identified and courageously named the major sources of air pollution: the automobile, oil refineries, power plants, and steel factories.”* And that’s when oil refineries, for example—I’m remembering; it’s not in here—had roofs on their tanks. But they were then, afterwards, forced to build floating roofs.

Cohen: Ah, so that there wouldn’t be any in-between; so that the roofs would go down with the level.

Haagen-Smit: Yes. That’s why we have the double gas tank. Most states don’t have that; some have it, but most don’t. And you had the volume of the whole empty tank, vapor that goes into the air. And they could calculate that with so many fillings, so many hydrocarbons you stuff into the air. They did all that work. That’s where the power plants came in, because Edison used to make power with oil, and now they have a long season when they are allowed to use only gas.

Cohen: You know, Zus, this story’s very good. But you told another story about testing with the microlab, about testing the urine of horses.

Haagen-Smit: Yes. Of course, that story is not in here at all. I tried to look back. We bought this house in 1941, so that was in 1940.

Cohen: Because you know that’s where the money came from to buy the house.

Haagen-Smit: Yes, that’s right. But I couldn’t even ask one of the children. Jan Willem was six years old then, and Miesja was three years old, and Grietje was one year old, so I couldn’t ask any of the children if they remembered that. Well, one of them said that we always said that that was why we had this house.

Cohen: Because Arie tested horses?

Haagen-Smit: I was trying to think back. I think that Arie came up with [the finding] that some horses were doped and some were not. Either way, it doesn't matter if he said no or yes. What I saw for sure is that he got paid for doing it. [Laughter] That was Del Mar Race Track. [Tape ends]

ZUS HAAGEN-SMIT

Session 2

March 20, 2000

Begin Tape 2, Side 1

Cohen: Now, you told us how Arie got involved in smog research and that he was annoyed with these companies, and he devoted himself full time to this because he was so upset with the Stanford Research Institute people and some of the others. That really pushed him into this as his full-time occupation.

Haagen-Smit: Just a moment, I want to tell you this as an aside. One man, who I think was from the Stanford Research Institute, was so careless as to write on the paper that he gave Arie, "You know where my livelihood comes from." He was saying, "You know, I *have* to say these things." [Laughter] You usually don't put something like that down on paper.

Cohen: What would you say was the first big company that Arie dealt with? Was it General Motors, or was it the oil companies here?

Haagen-Smit: Well, I'm not sure, because of course the automobile industry fought him tooth and nail. But the oil companies did the same thing, because it became very clear that all their refineries were spewing enormous amounts of smog-producing vapors into the air, just like the automobiles did. Some things you could solve quite simply. For example, you could begin by plugging all the leaks at the refineries. And if you started working on that, then you accomplished something.

Cohen: Did the refineries start working almost right away, when they were shown that they were producing these things? Can you remember how that went?

Haagen-Smit: I think Arie went there and talked with the people in charge. I remember that they had open ponds with gasoline products that were just evaporating, evaporating, evaporating.

Cohen: That was right here in Los Angeles?

Haagen-Smit: Yes, in the Wilmington-San Pedro area, where all the refineries are. There were open reservoirs of oil products evaporating. It was very simple to prevent that. You could cover it, not let it go in the air. I think once they were shown that that is what happened, they were willing to correct it.

Cohen: What gave Arie the entree?

Haagen-Smit: Probably it was because he was a member of the Air Pollution Control District. Or the Air Pollution Control District told the refineries that so-and-so was going to come. [Arie Jan Haagen-Smit was a senior consultant to the Los Angeles County Air Pollution Control District 1950-1972.—ed.] So the refineries were the obvious places to start. Their ponds were not little ponds; they were big ponds with oil products in different stages of refinery. One of the things I remember is that all of their tanks had roofs over them. Of course, between the level of the oil and the roof, there was vapor. So the next thing was to make the roof float so there was no room for vapor in between.

Cohen: Did the companies themselves figure this out?

Haagen-Smit: Oh, no. I think the combination made it obvious that that's just what you should do. I would say that Arie had common sense, and common sense tells you that if you have vapor there in between, then you let the roof go on top of the fluid. Then you don't have the vapors anymore.

Cohen: So you think it was a combination of his ideas and them being cooperative?

Haagen-Smit: Well, yes. They understood perfectly well that he was right. I think that the oil industry has taken that on pretty well, because they were losing, too, having all that vapor go up in the air.

Cohen: So it was to their benefit.

Haagen-Smit: Yes. It was also to their benefit to do something about those ponds that were evaporating in this climate like mad, and to do something about all the leaks they had.

Cohen: Did Arie do a lot of travel down to the companies?

Haagen-Smit: Oh, yes. For a while, when he was working full time for the Edison Company, he had an apartment there. He didn't like that apartment business. He had it for only a few months. It saved him the trip from Pasadena to the Edison Company, which was of course at the beach; but he didn't like it very much.

Cohen: [Laughter] He wanted to have dinner at home.

Haagen-Smit: Well, I think he thought that we all would come, and we didn't, of course. The children were in school here. I think I was there once. But, no, that didn't last very long. Arie worked for Edison, and they were appreciative; he had no problem. The people he worked with were all engineers—educated people. They were totally capable of understanding the arguments. They could easily be convinced what they should do. He convinced people—and it was not so difficult—that his arguments were right, and that they were losing money by not following his recommendations. That's why now, for example, the automobile companies, too, have put those double hoses in.

Cohen: When did he start working with the automobile companies?

Haagen-Smit: The [California] Air Resources Board was the one that dealt with the automotive sources of air pollution. That was established under [Governor Ronald] Reagan in 1967. In '68 Arie became chairman of the Air Resources Board. He traveled regularly back and forth to Sacramento. [Laughter] His pay to stay in Sacramento was \$25, and the only room he could get for \$25 was a room next to the elevator. [Laughter]

Cohen: How did he go up there? Did he fly? Would he go there and stay for a while?

Haagen-Smit: Well, he went when there were meetings of the Air Resources Board. That is when they had the big fight about the catalytic converters, because what came out of the tailpipe was all hydrocarbons that had not been burned. So by putting in the catalytic converters, they burned the unburned part of the fuel.

Cohen: Putting in the catalytic converters was not to their financial benefit, so they were not too happy about that.

Haagen-Smit: No. And to get the right ones, of course, they had competition. There were many people who tried to get the approval of the Air Resources Board for *their* catalytic converters. So there were big battles about which converter was going to be the right one.

Cohen: Now, did Arie take leave again to do this?

Haagen-Smit: No. This was regular—not a separate leave. When Arie was already very ill, they named an Air Resources Board building in El Monte after him—the Arie. J. Haagen-Smit Laboratories of Air Pollution Research. I have been there only once or twice; there were letters missing in the name.

Cohen: Who took them off?

Haagen-Smit: Well, nobody knows who did it, but you know those destructive kids that do all kinds of things. So there was an A missing or there was an S missing. Well, anyway, I haven't been back; I know exactly where it is. Then Arie was very ill. One of his very good friends was [Frank] Lanterman—Assemblyman Lanterman. And Lanterman tried to do something good.

This is a totally different subject. Lanterman was the one who tried to get people out of the insane asylums and tried to bring them back to the communities where they came from. He thought that would be a way for them to be better treated than they could be in hospitals. But of course it meant that the local communities then had to take over, and they didn't.

Cohen: So we had the first really big batch of homeless people.

Haagen-Smit: Right. But Lanterman was not to blame for that. He had set it all up. It was just that the local communities didn't follow through with their obligations.

Cohen: Yes. We always blame Reagan for that. It's a good idea, except that, as you say, the communities didn't carry it out. But in some way Lanterman was also trying to do good on the air pollution issue?

Haagen-Smit: Yes. For example, at the dedication of the Air Resources Board building, Lanterman was there.

Cohen: When they dedicated the building and named it the Haagen-Smit Laboratories?

Haagen-Smit: Yes.

Cohen: So back to the battle involved with the catalytic converter: Was Arie directly involved with, say, General Motors?

Haagen-Smit: Yes. Well, for all these meetings there were always representatives from all the automobile companies, because they were directly involved, of course. They had to install the new equipment. They had the catalytic converter, which is at the end of the chain of burning, and there is another one that's in the engine. They also checked that, and that also improved the burning of fuel. Another major change came about when they said, "Well, if you let your automobile tank get empty or near empty, the whole tank is filled with vapor. When you fill it, all that vapor goes into the air." So they developed the double hose, so that the vapor would go back into the fuel tank in the ground and become fuel again.

Cohen: Who actually did the research on these improvements?

Haagen-Smit: Well, you didn't need research—you only needed common sense. [Laughter] All these things were obvious. If you just gave it a moment's thought, it was obvious that all that vapor would go into the air.

Cohen: So it didn't take a big research laboratory to do it.

Haagen-Smit: No. A lot of these problems were [solved by] just plain common sense. The catalytic converter was a little more complicated, of course; that had some chemical arrangement necessary for it. But the roofs on the tanks and the double hoses for filling your automobile tank were plain commonsense things. They didn't need a scientific genius to figure it out. But almost every one of those things was a battle. To get those hoses changed cost money, and people fought it. They would have hearings, and people would either object or agree or want to modify or want it less stringent. And that is what Arie's last many years were taken up with—fighting. But he had totally convinced the automobile industry. He was good friends with all the research directors of General Motors, Ford, and Chrysler. They were his good friends and they were all totally convinced that he was right. But they still had to consider the bottom line, so they still had to argue. The industry did end up making all these improvements. You can compare it with the air bags, more or less. That is also a battle: What kind of air bags do you have, how strong, and so on. Of course, all these modifications cost a lot of money. The research departments in the automobile industry increased enormously, because they had to make the arguments to the higher-ups in the company that the modifications were necessary.

Cohen: When Arie was doing all of this, what was he doing at Caltech?

Haagen-Smit: He said he was not doing much else then but telephoning. [Laughter]

Cohen: So he really didn't have another research project going?

Haagen-Smit: No. And it was, of course, the end of his term, anyway. You retire at sixty-eight. Then you have two years more at half pay, and then that's it. And that, more or less, was the end. By that time, I would say that the battle with industry had been won. And then you come

to what they are now battling with. Just last night or the day before, there was a big argument in the newspaper about the AQMD [Air Quality Management District], because they had put up stringent requirements for all kinds of small industry, such as cleaning establishments that use solvents. These companies said, “If we have to follow those rules, we will go out of business.” That’s sometimes true and sometimes not true—they often exaggerate. Arie had a lumber company somewhere that argued that they couldn’t comply with air-quality requirements—that this would kill them, ruin their business. Well, Arie had to decide: Are they just putting it on because they don’t want to pay, or is it true?

Cohen: Arie looked into that kind of thing?

Haagen-Smit: Yes. There were arguments back and forth, just like you have in the legislature or anywhere. But I would say that the major things were done. Well, you hardly hear the word “smog” anymore. In the weather forecasts, they say “haze.” And there *is* haze. There always was haze here, and there always will be haze here. But it used to be that when you were in the house, like I was, and you would open the front door in mid-morning, you would sniff and say, “There it is.” It had come over from Los Angeles with the regular flow of air from the west to the east. By about mid-morning, you had it here. You could figure on it. There was nothing very complicated about it. It just came from there.

Cohen: So tell me, who were his colleagues here at Caltech? You mentioned Sheldon Friedlander.

Haagen-Smit: Sheldon Friedlander. Well, Arie had the whole staff in the Air Resources Board headquarters here—that then was named for him. They were his coworkers, but they were not Caltech people. They were all kinds of people. John Maga—I don’t know what his title was, but he was one of the upper men.

George W. Beadle was here when he was already ill. There was a meeting in the Athenaeum—

Cohen: Who was ill? Arie or Beadle?

Haagen-Smit: Beadle was ill; Arie was already dead, I think. We were sitting in a corner of the lounge in the Athenaeum, and I remember Beadle saying, "He was right after all."

Cohen: Was this about Arie?

Haagen-Smit: Yes. Because there were people at Caltech also who didn't believe that he was right. It wasn't only outsiders. There were also people at Caltech who didn't believe it.

Cohen: Do you remember who they were?

Haagen-Smit: No, I wouldn't know who they were.

Cohen: But he had to convince people here, too, is what you're saying?

Haagen-Smit: Yes. Arie was right. It's been proven. After all, since his work began, the population here has probably doubled. Automobile traffic certainly has doubled or tripled, or quadrupled, maybe.

Cohen: More, I think. Traffic is so terrible here.

Haagen-Smit: I would say that the argument now about oil prices is ridiculous. People want to drive bigger and bigger and bigger cars—all those SUVs—and then they complain about the price of fuel, instead of saying, "We should drive a little car." I have a little car. It probably is not the most efficient car, but it is a little car.

Cohen: Of course. People are ridiculous about that. Let's go on, Zus. When did Arie start getting all these awards? He won so many awards toward the end of his career. Which of them meant more to him than others? Can you remember what gave him a lot of pleasure?

Haagen-Smit: Well, I can think of one that gave him a little *different* kind of reward—the Rheinland Prize he got in Cologne [1974]. I didn't go, because at that time, Grietje, one of our daughters, was in difficult circumstances. So I said, "Let her go." She went with him, and my family in Holland came. With some difficulty, Arie gave his acceptance speech in German [laughter], which wasn't easy after having been away for so long. But he did it. When he died [March 18, 1977], they wrote quite a bit about him in the Dutch papers. Europe was well convinced, too. But of course, the older I get, the more I feel that so many decisions are made purely on financial considerations. And even if people know better, modification costs money, so they don't do it, or they fight it. All these people that complain about oil prices now—I think it is almost disgusting.

Cohen: What other prizes besides the Rheinland Prize?

Haagen-Smit: If you turn [the tape] off a minute, I will show them to you, and then we'll talk about them.

Cohen: We'll come back. [Tape is turned off, then on.] All right. We just looked at all these medals and honors, and it's wonderful! Now, tell us about the Cottrell Prize [Frederick Gardner Cottrell Award, 1972], which came about the same time [as the Rheinland Prize].

Haagen-Smit: That was from the National Academy of Sciences, in Washington. Arie got several awards that day, when he became a member. Among them was the Cottrell Award and one other one—I don't remember which one it was. But that was quite a day. It was my first time being in Washington, and since I was interested in politics I spent a lot of time in Congress while Arie attended meetings. I listened to hearings and thought that was very interesting. And Washington is beautiful, which I didn't know before that, really.

Cohen: Now, the National Medal of Science, of course, is a very big one, so the whole family went to Washington?

Haagen-Smit: Yes. That was an interesting day. It was a hot day—1973. There was a long line of people. We were to be brought in through the back [of the White House]. Besides the family, Arie had just one coworker there, with his wife. We stood there and we stood there and we stood there in the sun, and nothing happened. People got kind of disgusted that they kept us waiting. It turned out that Nixon had to see some Eastern diplomat, so that was holding things up. Well, we were finally led in through the lower back door and up the stairs and brought in to the East Room. The men went on the stage, and the ladies were escorted by somebody in a dress uniform. Then the scientists got their medals, and the reasons were given for each award. Then there was a reception—I think that was in the Blue Room—with [President] and Mrs. Nixon. The president asked everybody where they were from, and then finally, when he got to us, he had somebody from California. [Laughter]

Cohen: Were you the only people from California?

Haagen-Smit: I think we might have been. I'm not totally sure about that. And that was it. No, that was not it! We went to the State Department. There was a reception at the State Department. We went with all the family to the Washington sights. We went to the FBI building.

Cohen: So you were tourists also.

Haagen-Smit: Tourists, too, yes. We had a car, and from there we then went to the Amish countryside, which was very nice.

Cohen: So you had a real holiday. Now, you told me that one of the [prizegivers] didn't pay your way. Was that the Smithsonian?

Haagen-Smit: No. That was the Franklin Institute. [Laughter] I'll never forget it, because we checked out and we expected—

Cohen: That was the Cresson Medal [Eliot Cresson Gold Medal, 1974]?

Haagen-Smit: Yes. And we expected that our bill would be taken care of, and then we found out that we had to pay it. [Laughter]

Cohen: Not nice.

Haagen-Smit: We thought that to give somebody a medal and then not even pay for the hotel was pretty stingy. [Laughter]

Cohen: Yes. And the Hodgkins Award? That was a state award?

Haagen-Smit: What was the Hodgkins? I don't remember what that was [Hodgkins Medal, Smithsonian Institution, 1969].

Cohen: All these awards came together in a few years?

Haagen-Smit: Yes, they all did, because finally the whole world was convinced that the automobile was the problem.

Cohen: Now, what about this Richard Tolman Medal that you just showed me? When did that come?

Haagen-Smit: Yes. I don't know when he got it and how; I don't remember. [Richard C. Tolman Award, Southern California Section, American Chemical Society, 1964].

Cohen: Now, this is the point where I very often ask, "Was this a happy time?" That is, were you happy to have been part of the Caltech community? But that's obvious. Arie really did love it here. I know that.

Haagen-Smit: Yes. Oh, yes. We liked the Caltech community. When Arnold Beckman gave the speech accepting the Tyler Award for Caltech, I had to say something, and I'm not a person

who wants to be a public speaker. But I had to say something, so I said that Arie had always appreciated that Caltech gave him a total free hand to do all this work that really had nothing to do with Caltech. Nobody ever said, “You can’t do this because you have to attend to Caltech things.” They allowed him all the time he needed to do this outside work, which was practically all his time in the few years that he was battling to get his explanation and his reasoning accepted. As he said, “I spend my time on the telephone.” But nobody ever complained. They never said, “You are giving too much time to outside [work].” Arie never got any money for any of the outside work—nothing.

Cohen: So you always just lived on the Caltech salary?

Haagen-Smit: Yes.

Cohen: There wasn’t the idea of companies and consulting fees?

Haagen-Smit: None. They might have given him a tie. I just had to throw out all those ties.

Cohen: Of course, these were mostly public agencies.

Haagen-Smit: No. The automobile industry.

Cohen: Oh, that’s right. Of course.

Haagen-Smit: He had a tie from Ford and he had a tie from GM and he had a tie from....

[Laughter] But that’s as far as it went. And I imagine they paid for his airplane tickets when he went to see them.

Cohen: Now, Arie also was busy growing orchids. Where was that?

Haagen-Smit: That was just a hobby.

Cohen: Was that here at the house?

Haagen-Smit: Did you know Edith Vanoni [wife of Caltech engineering professor Vito Vanoni—ed.]? She had a whole greenhouse full of orchids, and she gave Arie some. When Arie was retiring, I said to the children, “Well, maybe we could enclose the side porch and make an orchid house for him.” But he didn’t want that. So he just had some orchids. And they, of course, gradually have all died. Nobody takes care of things anymore nowadays.