PETROLEUM INDUSTRY ORAL HISTORY PROJECT
TRANSCRIPT

INTERVIEWEE: J. C. Hans den Boer

INTERVIEWER: Tina Crossfield

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TC: This is June 26th, 2001 and we are with Mr. Hans den Boer at his home and my name is Tina Crossfield. Okay, can you start off and tell me where you were born and when?

HD: I was born in The Hague, the Netherlands, February 28th, 1929. My father was a plumber, as a matter of fact, he had a very unusual profession to start with, he was a specialist in I would think what you would call it over here was, driving copper material. ??? but of course, there was no future in that so he ended up working with his brother in the plumbing business. I have one brother, he's 2 1/2 years older than I am. Of course, coming from the background that we were from, basically a labourer's family, it was very unusual for us to have any advanced education. But we had a mother who was very ambitious. My brother of course, was the first one to go this way. She managed to get him into secondary education, which was at that time, already fairly unusual for people with our background. Once he had finished his secondary education she managed to get him involved in university work. That actually was in the early days of the Second World War. As a matter of fact my brother was at an age where he was eligible for going to Germany to assist the war effort there so he was one of the many thousands or tens of thousands of Dutch young men who went underground. So for the better part he was underground believe it or not, at the University of Lerden, at the museum of natural history, which was the field that he was interested in. After the war actually, he finished his studies and he has a PhD in biology, specialist in entomology. So he actually was underground during the Second World War in his chosen field. I was 11 when the war started and 16 when it finished and so we missed a couple of years of secondary education but other than that I managed to . .but by that time my mother knew how to go and get her son's scholarships and I was lucky enough to get a scholarship from the municipality of The Hague, which basically paid for my studies in geology right through a Masters degree. It was half scholarship and half interest free advance. I was fortunate enough in my work for my Masters degree to be at an area which had something that at that time was really a first and that was the first discovery of paleo-magnetism, the fact that rocks, particularly volcanic rocks would retain the direction of the earth magnetic field at the time that they solidified. So there are little magnetic minerals in there that are just like little compass needles and they would in these liquid volcanic rocks before they solidified, they would orient themselves more or less in the direction of the earth's magnetic field just like a compass needle does today. And this was discovered in 1956 in Iceland by one of the PhD students at my university, which is the State University of Utrecht in the Netherlands. I was working in a volcanic area, basically doing compulsory field work for my Masters degree in an area in southeastern France, in the Provence where many people would die to go for a holiday. And working in a volcanic area and

when my promoter, who was the same promoter for this fellow who was doing the work in Iceland came over to see me and had this information discovered that these ???, these volcanic rocks were actually magnetic and had basically the direction of the earth's magnetic field, well you can say, cooled into them. So we tested this out in the field. I had already noticed that the rocks that I was working with were extremely magnetic because geologists work with a geological compass, we do measurements on layers and define the structural directions. And these measurements use of course, a very special compass, a geological compass and I found time and time again that the compass needle would just lock, you know, it was being attracted by these rocks. To such an extent they were so strongly magnetic and so we indeed found out by very few tests that this area was also very interesting from this new science of old magnetism, paleo-magnetism. So I did my field work in this area, using this new technology. Because it was interesting enough I ended up doing a PhD on this subject and so I ended up with a PhD in Geology but the PhD thesis was very largely based on this new science of paleo-magnetism. Which of course, today it's well known because we know about continental drift, which basically it's paleo-magnetism which really clinched the theory of continental drift. Because that's how we found out that the continents had moved because of this solidified magnetic field in the rocks. And so we have found out that the magnetic poles, the basically wandered over time. And so because essentially the earth's magnetic fields is fixed in space, it is an astronomical ???, the rotation axis of the earth is fixed in space. And the magnetic field is tied to that rotation axis. So if you find that in different periods of time there are rocks that have a completely different direction the only conclusion is that at one time they were sitting here but they have drifted away so it is this paleo-magnetism that confirmed the movement of the continents. So at that time in 1957 it was a really new thing. As a matter of fact I got a Summa Cum Laude on my PhD thesis for that because it was such a brand new subject.

#083 TC: It must have been terribly exciting.

HD: It was. Of course, at the time, it was just work at the time. It was in retrospect that I found out that really was a very exciting time. It's very often that you do find that in retrospect that you had a very good time where you did some very good work, very often you don't realize it at the time. But it was an exciting time. Anyhow that's how I ended up with, I had a Bachelor's degree, Masters degree and a PhD in geology and geophysics, a combination of the two.

TC: Can you just back up a little bit, your Bachelor's degree was at which university?

HD: All three degrees were at the State University of Utrecht in the Netherlands.

TC: Okay, because very often people do a B.Sc. in one university and then they go to another university and. .

HD: That was not very common in Holland because the universities were pretty well equipped for a general program. The idea of switching very often is related to the fact that certain programs are not available. Masters programs may not be available at the university where you got your Bachelor's degree. There are so many universities in North America and Canada, but particularly in the States, that they would not be able to provide a total

comprehensive program in every subject. So that is generally the reasons why people would switch, maybe a Bachelor's degree in general science and then they want to specialize at a certain area but they can't do it at that university. But that wasn't the case in Holland. We didn't have many universities in Holland at the time, there was Leiden, there was Utrecht, there was Gramigan??? and I think those were the three at the time. So in a country that at that time was 10-12 million people, only three universities. But each of these universities had a complete program in every subject. So that's why I did all three degrees at that university.

#108 TC: Okay. And my geography is a little bit weak when it comes to the Netherlands, did you tell me the city where you were born?

JB: I was born in The Hague, which is one of the largest cities, right on the west coast. Of course, the country is very small. And the closest university was actually Leiden which was about 20 kilometres away but I wanted to do geophysics. In high school I was very good in physics and maths and the classical geological training was geology with biology, you know, the palaeontology aspect. And Leiden had that direction but I was interested in doing geology with physics and math and you see, ended up with a junior??? degree in geology and geophysics and geophysics at that time at the university was very, very new. They had just started that at Utrecht and so that's why I went to Utrecht. And that was 60 kilometres away from the Hague. Of course, in North American distance it didn't mean a thing, 64 kilometres we do that from. . you know, you drive from Okotoks just about that distance. But in Holland, if I'd gone to Leiden I could have stayed at home and take the train, the tram. Having to go to Utrecht which was 65 kilometres away I of course, had to get a room and live in Utrecht, which I did. And I'm very happy that I did because since the geophysics program had just started, like most people who start, everybody wants everything in there and I did really two majors in geology. My major was in geology and my secondary was in geophysics but that secondary had so many new programs in it that it ended up being a second major. Which in retrospect was a very fortunate thing, because I ended up as you know, I ended up being a geophysicist rather than a geologist in the oil business. Now the combination that I had, geology was a major, geophysics and petrography were secondary subjects. As I said, the geophysics turned out to be a second major. But the combination was specific for hard rock geology, mining business. So when I came to Canada in 1957 after finishing my PhD degree, I actually went to Vancouver looking for a job in the mining business, in hard rock geology. And the reason why I went to Vancouver because my bosom buddy, we started the same day in university and actually we did our Masters degree the same day in the same room, he was over there, I was over there. So we were buddies right through university time and he and his wife, the girls knew each other very well too, he went to Canada, which at that time was a very good opportunity for geologists after his Masters degree, so that was in 1955 but I had the opportunity to go on for the PhD. So I stayed on for another 2 years to do the PhD but he kept on writing me how wonderful it was in Canada and there were really no opportunities for geologists in the Netherlands. This basically is the Delta of the Rhine and the Mozel??? river and there was no geology at that time. Oil and gas were

discovered of course, after we left. They found one of the biggest gas fields in Europe in the Netherlands in the northeast of the Netherlands. But at that time anyone that did geology knew beforehand that they would be going some place else in the world. And so at the time I finished there were basically two opportunities, one was working for the French Geological Survey in equatorial Africa and the other one was to kind of burn all your bridges behind you and immigrate to Canada. Which is what we did. My wife and I knew each other from high school, we were high school sweethearts, so she was working while I was at university, we had a 3 month old baby when we came to Canada with $120 in my pocket. And of course, the interesting thing was that I probably arrived at one of the worst times in the mining business. The mining business in Canada is very much up and down, has been basically, that is their history. You know, base metal prices go up and the mining business is booming, two years later the base metal prices go down and the mining business goes down. And I arrived at one of the lowest points at the year 1957 and I had two small jobs in the minign field but I could see that that was not going to work. I was not terribly interested in oil geology, which was my major, so when I decided to look for a job in the oil business I decided that what I wanted to do was go into geophysics. So that's how I ended up in oil geophysics, basically because the mining business in Canada, the bottom had fallen out of it in 1957.

#176 TC: What were the two small jobs that you had?

HD: One job was for the British Yukon Mining Corporation, which was the mining arm of the White Pass Yukon Railroad, you know the little railroad that would go from Whitehorse to west coast of Alaska. The interesting thing, that was the most interesting assignment I think I've ever. . because they said, it was not important, the deposits were very rich, the thing that any mining engineer or mining geologist wants is you want a very rich gold deposit, very richsilver or very rich copper. But in that case it was not that important that it was very rich or very high percentage of mineralization but it had to be big. Because what they wanted, they wanted to transport it with the railroad you see. And the more tons there were to transport, the better it was for the railroad. That was not the most common assignment for a mining geologist. That was strictly, you know, they Yukon you could only operate from the middle of June to about the end of September so it was a seasonal type of thing. The other ones, when I came back in September, I did come back and I had a short job in south central B.C and as a matter of fact, near Trail B.C. There was an old copper, gold mine that and I found out later it hadn't been operating since 1925, this was 1958. And there was a promoter who wanted to see whether he could open up this mine and get it working again. But he did not have any geological knowledge, he was a mining engineer, without really, a strong background in geology. And so he needed a geologist to do the mapping of this mine. So I was on my own in this mine and that was no a very happy. . you know, this mine was veyr old, you can imagine the safety conditions there were just terrible. Damn near lost my life in that thing because you know, of course, none of the supports, the wooden supports ??? these places and everything was half way rotten. So this was not a veyr good place. I finished the job and that was it but by the time I finished that I could see that there was just no way that the hard rock business was going

to have any future whatsoever, so that's when I went after the oil business. But those were the two jobs. And they were interesting but I still think that the one. . have you been in the Yukon?

#216 TC: I've been in the Territories, not the Yukon.

HD: To me it still is the most exciting job I think I had. Because I still feel that the season there, somehow or other nature seemed to be compressed into that three months or four months of summer. The wildflowers, I was working basically at an Alpine meadow level and the wildflowers were just . . . and the colours were so vibrant. Maybe it is in just my memory but this is what I recall about the Yukon. And very interesting because of course, I worked with prospectors there and these are the typical guys that go to the north and they only want to die in the north. They wouldn't want to go anywhere else and they are very, very special types. I've had some very interesting and hairy experiences as well. Plus an interesting time, even for four months. So my geological experience wasn't very extensive in Canada but my geophysical one as you know, 32 years with Mobil Oil. That's why I thought you might have come on to my name from Arnie Nielsen and Don Axford. Of course, Arnie Nielsen was President of Mobil and Don Axford was Vice-President of exploration at Mobil when I was Chief Geophysicist. They thought the world of me, so I thought oh, when I saw those two names, I know where Tina got my name.

#239 TC: Just to back up a little bit, you said that when you left the netherlands your wife was working as well, what does she do?

HD: She has secretarial. . you know, we both finished high school and after high school, her family, she would have loved I'm sure to go to univiersity but there was just no possibility, her father was working for Royal Dutch Shell, the biggest oil company, one of the biggest oil companies in the world, but he was working as a translator. He had diplomas in French, German and English and so he did translations but it was a clerical position and certainly did not allow him to have his children come to university. As I said, I was fortunate to go, there was just from my background particularly, you did not go to university. As a matter of fact you didn't go to high school in those days. So as I said, I was very, very fortunate to be able to go there. She took these special secretarial schools after high school and so she worked. As a matter of fact, her first year was for the Marshall plan, which was the assistance plan after the Second World War, the American assitance plan to try to get western Europe back on its feet. So she was a secretary there. Then we got married. We got married at the time I had my Masters degree and so she came to Utrecht and then she worked for a hardware wholesaler and she was the secretary of the President of that company. She was obviously a very, very good secretary because he hated actually to lose her but he knew beforehand that that was going to happen sooner or later. So she worked in, which is interesting now because she is very, very involved in the relationship between spirituality and healing so she is doing her university education at her age now. She's deeply, deeply involved in that.

#277 TC: That's great.

HD: Yes. It's very neat I think so too. She's taking 3 courses this year at different places and basically the courses are anatomy and physiology and these kind of thing. Obviously the hard work is always the. . . so she is doing her university education at the age of 72.

TC: I think that's really great. So now tell me what happened after you left Trail, B.C. Actually you left the two . . .

HD: We had a couple of very tough months because I did not get to work for Mobil. As a matter of fact, I applied for jobs with several oilcompanies, Mobil being one of them but that was at the time, that was March of 1958. We came to Canada in May of 1957, so between November of '57 and Marchof '58 basically I had nothing. Canada had a very good program to provide temporary support for immigrants, knowing that it may take awhile to find your feet as immigrants comint to a new country. And here I was with 3 university degrees and not being able to secure any kind of job for a period. And once I got the job in March of course, I was able to repay. Because they basically gave you an advance for your rent and food. We had to kind of swallow our pride. That was a hard time. It didn't last very long and hasn't let any bad memories. Canada basically took good care of the people that immigrated, knowing that . . you know, I came to Canada, having had ??? languages, I did english for 6 years, French for 7, and German. Those are compulsory languages so we could understand English very well. Speaking of course, the ??? wasn't very good but we certainly had no problem making ourselves understood and we certainly had no problem understanding. There are an awful lot of immigrants that have come since, people that have no English whatsoever and that is really tough. But even at that, coming from a western country, the Netherlands, to another western country, there were very definite cultural differences. It was only 30 years, more than 30 years later, that I found out what the roots of our problem was that first year in Canada. And that's when we went to Indonesia in 1986 and we were aware of what is called, culture shock. Now we went from a western country, Canada to an eastern country, totally different culture. And so we were aware of the different cultures and so we were alert to culture shock. I suddenly realized that the biggest problem we had that first year in Canada was a matter of culture shock, coming from one western coutnry to another.

#340 TC: Yes, that's right.

HD: Yes. Because everything is different. People think different. We had British English and of course, this was North American, Canadian english and then there was American english differences. Difference in concept even of the same word, you know as well that some English words mean something totally different in Britain than they do in Canada and the States. So these are the kinds of things. But then the whole life is different. So we weren't cognizant of the fact but we very definitely were suffering from culture shock.

TC: Well, even the food must have been different, everything.

HD: Just slightly different. I remember that I don't know whether you want this on tape but my wife, she still tells this story, when she was embarassed to tears. In Holland when you talk about taking a shower, Holland has a very large Frnech background, Holland was the prime Protestant country in the 16, 17, 18 hundreds and there was persecution of the French Protestants in France and many of them moved to the low countries, to the north

1600 and something, whatever it was. So intermingled, intermarried and so there are very many French names, very many French words in the Dutch language. And one of them was you take a douche, that is you take a shower. And so our friends, we stayed with our friends, this bosom buddy I was talking about, for the first month or two and she went out of her way to have Helen meet her Canadian friends. And so there werre ladies coming to meet Helen and one of the things under discussion was, she would always take a cold douche in the morning. And these ladies looked very funny. This is a typical example of the kind of thing. Of course, Helen finding out afterwards, absolutely emberassed to tears. These are these just little things, it's culture shock. Anyway, it has nothing to do with geology or geophysics.

Tape 1 Side 2

HD: . . . work with people and just look at their professional aspects, they bring their families to work. And so, if you have absolutely no interest in their families then you cannot really assess what motivated these people at any particular time, why they are worried, why they are not performing at another time. So as you say, it's a continuum and if you don't realize that, in my opinion at least, as a manager you're not much good. It takes a while to learn these things though.

TC: Well, I think we've come a long way too in understanding the work place and how families are and relationships are. Back in the 50's and 60's, the current thought at the time was to make this separation between home and work. You didn't bring your work home and you didn't bring problems at home to the office. It doesn't work. Okay, now where were we?

HD: I think I just moved to Mobil, March of 1958. The oil companies, and they did this for the longest time, even while I was Chief Geophysicist at Mobil, would go recruiting at the universities, very often for summer positions. But they also looked at permanent positions and in those days I don't think they had summer students, but they were recruiting. Because the oil industry at that time, you know Leduc had been discovered in 1950 and I think Mobil started in 1949 or something like that. So they were just at the late 50's, beginning to develop, they had made some discoveries, but really, I arrived in the very early days of the branching out of the oil business, it was just beginning to flower. And so they were looking for personnel and I found this out later that there really were not many schools in Canada that had geophysics as a full study subject. Most of my conpatriots at the time, had physics degree, math degree, one fellow had an agricultural degree, I'm amused about that, electrical engineering. There was the odd geology degree, of course, all of them were bachelor's degrees, there were really very few graduate degrees in those days. And here I arrive with . . .in those days actually a bachelor degree in the Netherlands was not an official degree. You quit after your bachelor's exam, we had a bachelor's exam, but you didn't ahve a degree. The only officially recognized degree at the Dutch univeristies in those days was a PhD. Practicality had indicated that since a PhD was a research degree, was an official rrequirement for publishing a thesis in either a book form or in an established magazine of the profession, there were not that many

people that would do that. As a matter of fact, I was fortunate enough my promoter really was a promoter and when he asked me to go on for a PhD because of this new discovery of this paleo-magnetism in that area he said he would make sure that I would get an extra summer's field work paid for and he would see to it that I would get the publication cost for my thesis reimbursed. He was as good as gold, he got both of those. Of course, what he didn't tell me, the extra year of field work he got the money from the French government and then after I came back from that year he told me, of course, you realize that you have to write your thesis in French. Of course, I had not realized that. Anyway I wrote my thesis in French. That was another story. But there were not that many people that could afford to go on for a PhD because of these requirements. So by that time, it was generally accepted that a Masters degree was the final degree from a Dutch unviersity and the majority of people would find jobs with Masters degrees. But of course, virutally anybody coudl with a bachelor's degree, still I think the majority nowadays do, there are quite a few people now that go on for a greater degree because they hope that their employment opportunities are better. But in the 50's, there were very few poeple with Masters degrees. So my compatriots who were people with bachelor's degrees, as I say, in virtually every subject, except geophysics. So of course, I didn't realize at the time that I was rather an odd ball out as being truly the only geophysicist in the company.

#057 TC: Was that a problem for you?

HD: No. On the contrary, that has been the greatest asset to me in my career. Because I'll give you an example, the first job that Mobil asked me to do, they asked me whether I knew anything about the subject. Mobil had acquired some tar sand leases, the oil sands out there. They still have those and they had had a contractor do a geophysical survey but this was an unusual geophysical survey because it was an electrical survey. Now even today, electrical surveys, in the old days these are not done. That is a typical mining tool. In the mining business they use electrical surveys, magnetic surveys, gravity surveys, electro-magnetic surveys. But of course, that was part of my background. But there was nobody, they had had this survey done by contractor and they'd received the results with the contractors recommendations and conclusions but there was nobody in Mobil who could really assess the value of that survey. So they asked me and of course, I did. I think I'd been there two weeks and they asked me, did I know anything about electircal surveys, I said, yes, sure, they said, well why don't you take a look at this. So I did, not reallizing that they had nobody else to take a look at it. So I did some literature study and I did a fairly. . of course, I was a reasearcher, I had a PhD so I researched this particularl subject then analyzed the report, I wrote a report. I think to this day still that must have really raised some eyebrows because there was all kind of math in it, with integral equations. Nobody had ever seen anything like that. Here was this innocent research guy who didn't know any better. But of course, that really raised the flag and then it turned otu that we did some electro-magnetic and gravity work but again there were very few people that knew anything, so I ended up doing basically, the unusual geophsycial work in Mobil. In the very first 2 or 3 years. And that's when the real big thing happened. 1960 one of my bosom buddies at Mobil had been sent to our research laboratory, all our rresearch was

sent ??? the States. And we had a field research laboratory Mobil, and he was sent to what was called the Seismic Interpretation Course. He came back from this course and he said, man, we have no clue as to what we are doing in seismic. We are not doing seismic, we are just skimming the surface. There is a whole world of all math, physics, all kind of exciting things. And what had happened is, I think you may be familiar that, have you ever heard the term the Vella Uniform Project.

TC: Actually no.

HD: This was a project that was started by Massetchusets Institute of Technology, MIT, and it started in the middle of the cold war in attempting to detect nulear tests from the Soviet Union. And of course, these nuclear tests woudl crreate seismic signals, like earthquakes. And this project, and boy they had some incredibly brilliant people, to this day I am in absolute awe of the work that that project did, these people. Their names are coloured in gold in the industry. They actually managed to do ??? the top mathemeticians of their time, working together with these people and they developed technology to analyze these signals and actually determine which one was an actual earthquake and which one was a nuclear explosion. This was the first time that they were working with taking one of these courses where you've seen these wiggles and of course, they were recorded in those days when I came to Mobil in 1958, we were recording our little seismic explosions on paper, strtips of paper. And it was just in the year that I arrived that our research people had come up with a way of recoridng this on a special magnetic tape. They called it an analogue tape and basically it wrote that same signal on a piece of magnetic tape, just like your tape recorder is on while we speak. That was the first and then of course, in the next couple of years we ended up with actually recording these signals digitally, instead of recording it as continuous wiffles, we now started to record it as numbers, the deflection every so many miliseconds. And that is when the big, big explosion started in digital geophysics. And I've been right through it and guess where I was, smack in the middle of it because I was the researcher at Mobil Canada, I was the one with the PhD, I had the math, the physics. I had shown them already I could do magnetics and gravity. I'm not trying to boast but that the background I have. So I became Mobil Oil Canada's geophysical sciences specialist. And our research lab, in this seismic interpretation course, was reporting these results that had come out of this Vella Uniform Project at MIT and they were advocating that we could use these things and should use this same theory on these seismic signals that we created ourselves. Because the seismic signals we use are really small earthquakes that we generate. So it was the same idea, there were certain. . the whole idea of the Vella Uniform Project was that they could process these signals through different, different digital programs. As we now know, you work with programs today, I do and those were very special programs to analyze these signals, process them in different ways, in order so that the results would show whether that was an earthquake or whether that was a nuclear explosion. And these same technologies were just beginning to be developed for oil geophysics, seismic signals that we create in the oil business.

#141 TC: So way back when you were doign electrical survey, was that sort of the

beginnning of seismic?

HD: As a matter of fact, must have, I think it may go as far back in the States as somewhere in the 30's or early 40's. But it was all recorded on paper. As they left the little siesmographs on the ground and they were electrical signals, you've seen ??? And that basically was them and what they had was a strip of photographic paper and had that electrical signal put on there and that was it. You did whatever you were going to do, you interpreted from that strip. Once we had the strip replaced by these broad magnetic tapes, there was a very short period of time, it was just a matter of 2, 3 maybe 5 years that we had this analogue magnetic tape, gave us an oppurtunity to actually take this trhough the analogue equipment, not really a digital computer but through some electrical equipment and do a little bit, look a little bit at the signal and maybe do some special electrical filtering. Witha limited amount of processing, you could separate, for example, the biggest problem in seismic recording is noise, we record little earthquakes but we also recrod all kinds of noise. Wind noise for example, on a windy day if you have trees right along your seismic line these trees are bouncing back and forth and they create vibrations and they superimpose on the stuff that we want to see. So one of the biggest problems has always been to get rid of noise. So with this analogue tape they could do a little bit of filtering out of some of these tree noise and wind noise and high line noise. For example, you stand right next to a high line, you have 60 hertz signal and that is a hum, so you could have a filter that just cuts out 60 hertz, then you get rid of the high line noise. That was the idea. So from the paper where we couoldn't do a thing to it, you just took what you had, wind noise, high line noise, whatever, you had to be smart enough to kind of separate that out by looking at it. To the analogue magnetic tape where we could do a little bit of processing, cutting out some of these noises, but then we went to the digital. Once we had the digital tape where we record just the numbers, just basically the deflection of these wiggles, just the number, +5, -3, +2, 0 +1, -1. Those numbers very closely spaced, that was the big thing and that has been the big thing ever since. That happened just as I said, in the early years I was at Mobil and as I said, the fellow that went to the Seismic Interpretation Course also had his eye on we should be able to do more with this geophysics than what we are doing today here at Mobil. And he came back and he was all enthused, all these wonderful things, this Vella Uniform Project, he had the mathematics, he had this great big book I still have it that went through all the details in this course and so I went straight to my boss and said, i want to go to that course, I want to go to that coursse. So I went in 1962.

#186 TC: What was your friend's name?

HD: Frank Halpenny. He was a Chief Geophysicist for Mobil and he went to the States and he was Chief Geophysicist in Devner I believe and the he came back and was Chief Geophysicist for Canadian Superior. I don't know whether you're familiar with the history of Mobil and Canadian Sperior or not.

TC: No, I'm not.

HD: We mentioned the name Arnie Nielsen, I should mention this in passing maybe. Mobil

Oil of course, was a wholly owned subsidiary of Mobil Corporation of New York, wholly owned, in other words 100%. Arnie Nielsen in must have been the mid 70's or thereabouts, late 70's, was our President. I became Chief Geophysicist in 1976 and then it must have been 2 or 3 years later, there were all these reorganizations and you know, we had new people come in New York. Many of the managers in New York, the people at the high top were not real scientists or even engineers, they were accoountants, you know numbers people, investment people. Anyway, Arnie had decided he had enough and he quit Mobil, it's unusual for a President to just go away and he became President of Canadian Superior, a smaller oil company, who also had, I don't know whether they were a wholly owned subsidiary but they were a subsidiary of Superior Oil in the States. And of course, Arnie was interested in bringing some of his good Mobil people along and of course, Mobil in New York was afraid of that. So they actually. . the political moving in there you know. . there were three names that they put out and mine was one of them that on the local ??? Mobil New York allow Arnie to steal these people. So he approached me and at the time I wasn't really that interested. I could see potential problems down the line, I wasn't looking forward to taht kind of thing. I was doing what I was wanting to do at Mobil. But my friend Frank Halpenny had no such qualms. And he did go and so he became Chief Geophysicist of Canadian Superior. These manipulations. But anyway, that was a sideline that was in the late 70's. As I said, by that time I was Chief Geophysicist at Mobil in 1976. But prior to that, my career has been somewhat unusual. I worked for Mobil for 32 years and the first 16 years of that I was in this applied research and what I did, I got quite a few offers to go down south, to go to the field research lab. They offered me the manager's job of the field research but I wasn't interested. The thing that has always intrigues me, excited me was to take this pure research and bring it to the firing line and use it. Because the people in these research labs come up with these wierd and wonderful techniques but they don't know how the actual practice is in the field, what I call the firing line. So what I did, I would go, I knew the people at our research lab very well after a few years, I worked with them very closely but I was the applied researcher at Mobil Canada. And that was my job, basically, is to provide tomorrow's technology today at Mobil Oil Canada. And so what I would do, I would go down to their research lab, find out what's new. And they had all these programs right. By the way, I wrote my first computer program in 1962 for the first Stuart??? program computer in calgary. You have never heard of it, it's an IBM 1620. And the IBM affiliate brought this computer in, prior to that computers that were used in business, they had wired boards you know, board with all kind of plug-ins, little wires and basically they was ??? and you had to be quite a wizard in knowing how to plug where, but they were wire boards, they were not the kind of thing that you have today, you have memory and you store your programs on a hard disc and then you bring in Microsoft Word, it goes from the hard disc into storage and you work with it. That was a Stuart program computer, well this IBM 1620 was the very first of its kind. I remember the most basic program in geophysics was a simulation of a seismogram, it's called a synthetic seismogram. And that computer of course, worked with punch cards. The programmer would go in there with pumnch cards. So first you had to write out all the instructions, then you key punched them and we did all that, then you

loaded the program into the computer and you loaded in the data and then you let it churn and get the answers out. And them came out in punch cards and you had to take those over to a machine that would put it in print. Now that simulation, that synthetic seismogram took 8 hours to run on that 1620. And in between that it would punch so many cards that we would have to empty the card hop and put new cards in because otherwise it wouldn't work you see, it punched too many cards. So I still remember, we went to the Christmas party one time and we had run through the synthetic seismogram the next morning and so at 5:00 we loaded in this synthetic seismogram program and we went to the Christmas party and then after dinner, about 9:00 we went back, we changed the cards. So the next morning sure enough. Now that same program, if I run it at home, on your computer at home or mine over here, takes nanoseconds. It takes longer for the message to finish to print. This is the technological advance that I have seen in my career. Of course, I'm still deeply in computers. My wife says I love my computers more than I love her. There she is, she just heard that, I can hear her chuckle. But this is the kind of technological advance we have gone through. And I've been part of this every step of the way, so you want to talk about an exciting career. I look back on mine, I couldn't have asked for anything more exciting than that. Because I was in the heart of it, as I said, I wrote my first computer program in 1962. And I kept on, as our research facility was developing these new digital techniques and by now, we record seismic data on digital tape and we have special, big companies that do nothing but using all this developed technology that are rooted in that MIT Vella Uniform Project and it's been developed, new developments, new changes, more changes. And it has been tremendous expansion in new technology. As I said, we now have companies that specialize in the processing of digital seismic data. Nobody records seismic data and then puts it on a desk and interprets it. It goes through this whole mass of computer program processing, it's a tremendously involved process to come to a final piece that then gets on to the desk of the geophysicist and the geologist, who then do their interpretation. Interpretation being, translating that record into subsurface geology, because that's what we're after. It's how does the subsurface look and are there potentials there for structures that could contain oil and gas. So I started when we still had paper strips and we did the interpretation right on the paper strip. Short period of time, analogue magnetic tape and then digital tape. And it's been uphill ever since. As I said, to such an extent, so the first 16, exactly half of my career I worked in this field, in basically taking pure research results and bringing them basically, reprogramming them so they would fit on our computers here in Mobil Canada and then making sure that our people would use these. That was basically my task. So you can see that I have a very, very strong technical background, you know, basically half of my career. Of course, this explosive development went right through the 60's, through the early 70's. And then it slowed down. There are still new techniques that build on previous techniques, this one does it a little bit better than that one, modifications of existing processes. But the new explosive development took place over the 60's and the early 70's. And I was smack in the middle of it and so I did all the basically, the reprogramming, from a research form to a firing line form so that we could use it on the firing line.

#349 TC: So the work that was done into the 70's is really the foundation of everything that's done right now.

HD: It started in the early 60's, let's say from 1963, 1964, onwards, through the mid 70's. About a decade this explosive development took place. And of course, first it started with companies trying to keep these things secret. Oil companies are wonderful for keeping secrets. Of course, nobody can keep things secret for any length of time but if you can keep a certain process secret for 6 months you may have a competitive advantage that might just find you an oil field that somebody else didn't. That's how Mobil for example, found Rainbow oil field, which is still one of the great producing oil fields. Because we had an advantage in one specific technique.

TC: As a pure researcher, the pure science, it's often looked on as science is meant to be shared, and it's for the greater good. But the technology side, it's very guarded and the application side, so you were right in that. . .

HD: I was on the application end.

TC: But you were right in that grey area between pure and applied sciences you know.

HD: Yes. I really do think that always what really triggered me was the application of pure science. In other words, I could see. . but you see, I understood that very well, when I met these people at our research lab they were very brilliant scientists. As I said, the privilege I've had, some of the people I. . .

End of tape.

Tape 2 Side 1

HD: The thing I was trying to say is that very brilliant people in their area of research, they recognize that this is a major contribution but they don't necessarily understand the ramifications of how you use this in an applied sense. And they loved me out there, you know, I would come and they'd treat me like a king because they knew what I was doing, I was taking their pure research. And I said, listen guys, for this to be useful for us we need this or that and so there were certain little angles that I needed out of there in order to make this thing work and actually use on our data. And so they loved me out there because I would give them the input of making some of their pure research more applied. In other words I gave them the application angles because I understood what is being done here on the firing line. They did not have that experience and it's very hard to guess at what these people out in the field do. And so providing that to them was a two way street and it did actually wonder for us here at Mobil Canada. For them it was wonderful because I would explain why I needed this, that or the other thing. And so they became much more aware of the application needs and channelled their research towards these areas. So very much when people talk about a win, win situation, that was . .

TC: Very collaborative.

HD: Yes, yes. And it was a wonderful relationship. Absolutely brilliant people, the one that I wanted to mention was the applied mathematician they had out there, he was considered

at that time, I found this out later, as one of the four outstanding mathematicians in North America. I remember one case, now I'm not a mathematician but I can handle my maths very well, my degree was in math and physics after all and I was working on a project on a certain formula that was in the area of aero magnetics, aerial magnetic surveying you know, aeroplanes, magnetometers. And we used that in the oil business, these kind of surveys and I wanted to do something in processing of this and I had this one formula that I needed to get worked out so that I could program it in a computer. I spent days, now as I said, I'm not a mean mathematician and I'm very hard nosed, I don't give up. No matter I spent weeks on that, there was no way that I could get that formula in a form that I could put make a program of it. So I finally called me friend at the research lab and he said, well, okay. He had a very interesting approach, you would ask him something and he would be dead quiet on the other end for 30 seconds. In the meantime I knew, after awhile, the computer he was working there, so I said, what, he said, give me the formula so I wrote him the formula over the phone and there must have been silence for a good 60 seconds and I'd learned by that time not to say anything. And then came the answer and he said, well, I don't think you can do what you want to do, I don't think you can do it that way. There, it has been 3 days, 4 days, whatever it was, trying to make this thing behave so I could program it and he took one look at the thing and visualized that there was no, not the type of solution that I was looking for. But he said, why don't you come on over. I was at that time working for a couple of months in Dallas at another lab there and so, he said, why don't you come on over. So it took me 20 minutes to get out of there and by the time I arrived, he had a big blackboard in his office, there were two different solutions on the board for that program. I'd never even thought of that kind of solution. You had this famous old thing that you have to think outside the box, he was very good at thinking outside the box, I was thinking inside the box, the kind of mathematical solutions that I was used to. And he realized by just looking at the thing that that wasn't possible, you couldn't stay in the box so he went outside the box and in 20 minutes time he'd come up with two solutions. These are the kind of people that I was exposed to, it was exciting, just incredibly exciting, really privileged you know, because they made me look fantastically good by giving me all this stuff and I would go home and reprogram it, put it on the firing line and we would get interesting results that way. A practical example that may interest you, some of this computerized work that we did, we had discovered, the little group that I was working with that what in our opinion the secret was of finding specific reefs in northeast British Columbia. Very hard to define geophysically but actually what we did, we had a program that would take a geological model, we'd say okay, these are the geologies, these are the faults???, these are the lithologies, this is the kind of rock there is, this is the shape of the rock and we would assign physical properties to them, acoustic velocity mainly and density and then we had a program that would actually produce a seismic section. Finally the end product of all this processing of actual field seismic data, we would simulate what that would look like if this particular geology was present. And the of course, you could compare the model, that's what it was, a seismic model, you could compare it to the end product of the seismic processing of the actual data. And I've done that through most of my career, of course, this is where my

geological background comes in. I'm approaching geophysics from the geological end, I say, okay, what is the geology that we are thinking that we are looking for and so my programming and I still have this on my computer here at home. . Once we came back from Indonesia and had my little company I basically rewrote all the technology that I had at Mobil and it's sitting right on this little notebook, I've been living with a little notebook computer that I can carry on. Most of these are simulations, using geology as input and then producing what the final seismic product would look like if that geology was there.

#075 TC: That's very good, that's prediction almost.

HD: It is, it is prediction. And on that basis we found that these particular reefs in northeast British Columbia, they would show up totally in an unexpected way. And it took a little bit of convincing to convince our management of that. We had to look for this particular thing that didn't look at all like a reef. We did 2 or 3 wells, we acquired the land and we drilled the well and we found those reefs. And Mobil spent, and in those days that was a heck of a lot of money, they spent $10 million on land in this area, northeast B.C. and they're still producing gas from all those little reefs in there. So this pure research, taking it to the firing line, there was a prime example of how this kind of thing really can work. So that brought us to the mid 70's, '74 and then there was enough recognition in senior management in New York that technology was taking such an enormous important place in the exploration programs that they as a policy, they wanted to have the managers of technical departments being very strong in technology. Prior to that a Chief Geologist or a Chief Engineer, chiefs of major departments may have been people who were more administratively inclined, may not have had a very strong technical background, you know, they may have been good geologists or geophysicists but did not necessarily have a very strong background in technology. Their background had been in administration to a very large extent. And that happened virtually with all companies at about the same time and Mobil, that happened in the mid 70's that they basically said, okay, we want our Chief Geologist and our Chief Geophysicist to be very strong technically. So this is when the pressure started. Finally I caved in and I think to a very large extent, I explained to you that the real explosive development had basically slowed down by the mid 70's. There was a decade of enormous expansion but by the mid 70's, and I suddenly realized that my position was, I had all this wonderful technology but the only thing I could do was recommend to our people in operations, which were our district superintendents, our exploration manager, I could only recommend, let's do this, let's do that, let's do it this way. But if they decided not to do it that way there was nothing I could do about it. And so when the pressure started on me to get into more supervisory positions on the firing line, I hesitated for awhile, then I tried it out as a district geophysicist and found out in very short order that this was wonderful because now I didn't recommend, I told them, that's what you're going to do. Two years later I was Chief Geophysicist and I haven't stood still since that time. So the second half of my career was as Chief Geophysicist but I had this tremendous background in technology. I knew programs inside out, I wrote my own programs. And of course, that has been a wonderful asset throughout my career as

Chief Geophysicist and Geophysical Manager because my department ran this way, on very strong technology.

#121 TC: So in the earlier days the Chief might have been one that just grew up in the company?

HD: That's right. For example, the fellow that I reported to when I came to Mobil was an old field hand. He had been in the early days, actually our company personnel was out on seismic crews when I joined Mobil, the first job that I had after that electrical survey interpretation, I went to a seismic crew. Mobil had actually two seismic crews of its own, the interpretation and supervisory personnel were Mobil and the drillers and . . they had some contractors but the geophysicists were out on the seismic crews. And that had been the picture, all right through the late 40's and all through the 50's, that is where the geophysicists grew up. They directed from where the shot hole was going to be and where the mines was going to be, when the paper records came out they made sure they were properly recorded and all stamped and properly written up. That was what the geophysics was about and they would make maps on the basis of they take this one reflection, they made a big map on that and that was basically what the geophysicist did. And so most of the geophysical personnel that ended up in first line supervisory or even Chief Geophysicist jobs had a background of this nature. Certainly no background in fundamental basic geophysical research or basic geophysical methodology.

TC: Yes, that's quite a big difference.

HD: But as I said, that change, that happened pretty well for all companies then. So what it did ensure was that there was a much more sound scientific background through most of the geophysical work that was being done. And you'll find that is very much the case today. There has been a shift from much of this highly technical work being done by the companies themselves, and that has happened in the last 10 years that it has been shifted to the contracting companies. With the result that the contracting companies are also very strong in research. And many of the things that the companies used to do themselves are now done by contractors. Because they acquired this research personnel, they have their own research departments. Because you have to realize that for one single company to have very large research facilities, personnel, equipment and all that, that's a tremendous investment but it's only used for the one company. The contract companies have that same group but they can use it for all their clients. In other words, basically their research overhead is spread over a very large number of clients and all the clients pay for it. While it was in the oil company itself, the total overhead went to the company's bottom line and in the long term we found that the contractors learned . . the research originally was done by the oil companies but of course, the contractor companies learned about this, started doing some of these things themselves and gradually they were able to provide essentially the same services that the companies ??? but only the contract companies do it a lot cheaper. So this is very much where the industry is today. Interestingly enough, my son, who's a very fine musician, we thought he was going to go in music but he was very good in math and physics and guess what he became, he became a geophysicist and has been doing essentially the same thing that I did in the first part of my career. But he's doing it with one of the larger geophysical companies, contracting companies, Western

Geophysical. He's in London, England, has been there for the last 10 years. And so that change, you'll find that there is an awful lot of merger and acquisition going on between these geophysical contracting companies, they're getting bigger and bigger and they're getting fewer. But at the same time they are tremendously strong in the technology end. And so there is very definitely today, you'll find very strong research background in the contracting companies and much less in the oil companies. Because they can get these services cheaper from the contractor companies, and as good, the services are as good as they could provide themselves. But basically you can do much cheaper. They say it's the oil and gas business but it's a money business, always has been a money business.

#182 TC: Oh yes, very competitive. And throughout this time were you located in Calgary?

HD: I was located in Calgary but because all the work, these firing line applications that I did for Mobil, I didn't mention this but the unusual thing was that in our research lab we had Control Data computer equipment, Control Data being one of the big companies. For some reason or other that is typical for a major oil company, don't ask me why, because I've never understood it but all the operating divisions all over the world for Mobil, had IBM equipment. But the research. . and these computers, nowadays, you know, you can go from one computer, take you disc over and. . not in those days. Control Data and IBM machines did not talk to each other. And that's one of the reasons why I would go to the research lab, say okay, give me a print out of the subroutines??? that you use in this manner, I will take the subroutines and then completely rewrite them in Calgary, write a major program, the main line program that would link all these separate things together. So I would build ??? that they had running on their Control Data machine, I would have to build a completely new one on the IBM machines. But the interesting thing was of course, was that once we had this, all the other divisions worldwide in Mobil were interested. Hey, I understand you got this, yes, can you bring this over. So I did a lot of travelling for Mobil. Germany was one, they had a big machine, I ended up. . the most interesting one was that in 1969 I went on a trip with one of my associates. Mobil had an affiliate in Tripoli, in Libya and they were working with an IBM computer that was owned by a contractor. The contractor was in the same building but Mobil was using this computer and the contractor was running it for him. They had heard about all these fantastic new seismic routines that Mobil Canada had on their IBM machine and they were interested in having that on their machine. At the same time Germany had expressed an interest and so we made a trip, the two of us. First we went to Libya and we had basically a whole suite of programs to work with seismic data and so we installed that on the contractors machine for Mobil and we tested it. So we were there for 2 or 3 weeks, working . . it was generally in the middle of the night because during the day the contractor needed him own machine. So we go the off hours. But Libya was still a kingdom, King Iberus III was there. We were there in July and in September, Kadafi, the revolution threw out King Iberus and Kadafi took over. The first thing he did was completely close Libya for any of data in, data out. Prior to that Mobil Libya would have their tapes and they would send them to Dallas to have them processed. They wanted this package that we had, which was not tuned to a volume processing of seismic data but

doing research type, take a small volume of data and do analyses and say, okay, this is how the data should be processed. And then you would take the whole mess and send it to Dallas and have them process it. So they wanted that analysis package basically from us, which is what we did. That's how we used it here in Calgary, we do the analysis and we say, okay, this is the problem with this data, we would analyze it, process a limited volume and demonstrate that this is the way it should be. Then we would tell the contractor to do this, that and that and they would do the whole volume. So they had this package over there in July of 1969, in September of 1969 Kadafi closed Libya off completely and believe it or not for 2 years after that Mobil Libya used that package of ours to process all their data. It was slow but they could do it. By that time of course, even Kadafi had learned that he was basically shooting himself in the foot by doing this and so he eased off and then they could send the data out again to get it processed. In Germany they also wanted the analysis package but they ran in the same way that we did here in Calgary, limited volume, do the analysis, find out what the problems are and then you can make recommendations on how the volume of the data should be processed. So I did a lot of travelling for Mobil in that time as a technical salesperson. So I was stationed in Calgary yes, but. . . I spent one year in Dallas, that was in 1963, that was shortly after I wrote my first program here. That was after I realized that there was much more to geophysics then we had known so far and by that time I had done a fair bit in magnetics and gravity and they wanted me down south to write some programs for the interpretation of gravity and magnetic data. So I spent a year in Dallas but other than that, after that I was here in Calgary until 1986. So the better part of my career. The last 4 years I was Geophysical Manager in Indonesia, in Jakarta. Where they basically needed the technology input, that's why they wanted me over there. And there you have my whole career in a nutshell.

#271 TC: And your wife went with you to Jakarta?

HD: Oh yes. As a matter of fact, in retrospect, we were very sorry that that opportunity didn't come around because it would have been wonderful for the kids to live in truly a third world country. To us it was a real experience, a very valuable experience from our perspective, in terms of seeing how a large part of the rest of the world lives, or not lives. It's a humbling experience. They had wonderful schooling, we that were in Jakarta. Most of our ??? were all over Indonesia, from the extreme corner of Sumatra all the way to New Guinea on the east end so we did a lot of travelling in Indonesia but we lived in Jakarta, the capital city. Mobil had very good services for people and schooling there was fantastic because they had the American school there, which was funded by all the embassies and all the oil companies, they had the best of programs, the best of teachers, fantastic. From a schooling point of view alone it would have been. . they are probably the best schools in the world because they had the choice of the best teachers everywhere. Programs, music programs, instruments, every year they put on a musical for example, they put on The Fiddler on the Roof, absolutely professional, just fantastic. Things like that, so for the kids it would have been very, very educational. Not just from the schooling point of view but I think just from the perspective of living in another world. It

is truly an experience that you have to have if you want to understand truly how privileged we are to live in this part of the world. I can bitch about the government but I can't really bitch that deeply if I look at the way we live, even when I think the government is not doing what they should be doing. It truly gives you a very different perspective. The majority of the people that were working there had been on international assignments all their career. And I think for that reason mainly, because they . . one thing, financially there was a great advantage as well because there was always a foreign living allowance, people were paid in U.S. dollars, I was paid partly in U.S. dollars and partly in Canadian dollars but we darn near lived on our foreign living allowance. So people could really salt some money away for your old age. So from a financial point of view it was certainly advantageous, living, because as I said, Mobil really looked after its people very, very well and I think most of these major companies did. So it was easy living. If you could put up with living in foreign countries, in several countries but as I said, the majority of these people had done this all their career, so I guess they liked it. We liked it for a period of time, I could have done it for longer. Indonesian government??? was interesting, they wanted people who had at least 25 years experience but they preferred that they were 20-25 years old. If you do the arithmetic on that, it doesn't work very well. So when I went over I was 57 and normally the Indonesians retire at age 55. They have just too many people so they have to flow them through so they have to retire them earlier. So the fact that I was coming there at age 57 was allowed to a very large extent because of my background. They had a special computer over there which I had used as Chief Geophysicist here in Canada, that was part of my portfolio. They had that same computer in Indonesia and of course, there was really nobody that had that the experience, the background to handle it, that was one of the main reasons why they wanted me over there. And so there wasn't a great deal of problem in that I had the expertise that everybody was looking for but I was really too old. Now of course, we fully expected that they would kick me out at age 60, they let me live till age 61 when they wanted me out of there. So we were there for 4 years, it was a very interesting time. But that is to a very large extent what I can tell you about my career and the business as it went through those days. Really exciting time in the field of geophysics. I hope that's what you're after.

#360 TC: Yes, very interesting. So you have a son who is a geophysicist and. . ?

HD: We have 3 kids, the oldest one is a girl and she is in Windsor, Ontario, as a matter of fact she's going to come over later this week here with our two grandsons. She has a degree in dietetics but she is now Director of all support services at one of Windsor's major hospitals. So she's got a bigger job than her father ever had. I'm not sure I would want her job.

TC: And what's her name?

HD: Claudia. And then our oldest son is Lennert, that's a very Dutch name and he is the geophysicist and then our youngest son who is in Vancouver, that's Mark, who is a graphic artist. Both these guys do everything by computer of course.

End of tape.

Tape 2 Side 2

HD: [in mid sentence]. . Helen still says she was absolutely furious because we had everybody set down for Christmas dinner at the table and the discussion, when ??? and she said, they could have just as easily talked Indonesian or Sanskrit because she couldn't understand a word, she was absolutely furious. Christmas dinner was totally spoiled because of this darn Apple 2-E computer. But none of these three guys have stayed still since then because ??? in computers.

TC: Well, it's the nature of our work today.

HD: It's truly amazing. As I said, to me, if I recall this particular simulation that I did, this seismic model, synthetic seismogram, 8 hours on the first stored program. Truly the first real modern computer if you want to call it that way, we were still working punch cards but it took 8 hours. If there was no card jam. Because all these punch cards of course, would go through this card hopper and if there was one little fold in there or so and then the thing would jam and then we'd start all over. For another 8 hours trying to get it to go. Nanoseconds today. We had, in 1968, we had truly a very sophisticate computer that was an IBM 360-40. You took the machine, you know the Mobil building downtown, the whole 17th floor was the computer room. There was the main frame, the disc drives, the tape drives and all that. We had a little and I swear that was that first computer graphics console in town, maybe in Canada even. I wrote actually a couple of graphics programs in 1968 for that machine. And I still remember I was Scout master at that time or Cub master and at the end of the little demo program there were two little spaceships that would float through there and have little ??? guns and if they made a hit. . . you can imagine, I had about 15 of these Cub Scouts in that little room and they were playing this game. The whole computer room, the whole 17th floor of that building was that computer. My notebook computer that I have, a little Toshiba does everything that that whole floor did at that time, only does it faster and does it better. Because that was monochromatic of course, this green stuff, just like the Apple 2, everything was green on the screen. But they did animation on there, it had the capabilities of the kind of graphics that you see today but in a very, very limited way. That's 1968. It was there. But it took. . you know, the Apple 2-E was really the first home computer that could handle things like that. In its time it was a fantastic machine.

#033 TC: I have a Commodore 64. Do you have any regrets?

HD: No.

TC: No, I didn't think so.

HD: No, you must be able to tell by the way I talk about it. I was talking to friends of ours, they have a daughter and she was home from university, I was asking what she was doing, she's a very smart girl. She was going into engineering, I said, well. . .??? to go into

engineering and as a matter of fact, she wants to go into ??? medical engineering after that. I forget how we got on this thing about jobs and things like that and I said, you know, to me it is extremely important that people do what they really want to do. I couldn't for the world imagine going to work to a job that I didn't like. I said to her, I really feel very strongly, there are very few days that I can remember that I went to work not feeling excited or something like that. Most days I went to work eager thinking something interesting is going to happen today. The odd day when your boss is raising hell and there are some of these environmental things, but fundamentally I have enjoyed every day of my career. I was doing what I wanted to do and I think, I was doing what I was best at. As far as I'm concerned you can't be more privileged than that.\

TC: Your parents must have been extremely proud of you?

HD: Yes. Unfortunately our mother did not survive long enough, she died when I was 20, after effectively the Second World War. We were an occupied territory of course, and in particularly the last year there was not a scrap of food to be had anywhere and it was truly a struggle for survival. You see, Holland is a small country, basically as I said, it's the delta of the big Rhine River that comes in and has a branch that goes to the north. And what happened is this enclave, D-Day, when they came in from France through Belgium they went into Germany. The Germans of course, had reinforced, they were sitting behind these major rivers there and the Allied forces were not interested in this little enclave on the west end of Holland, there was no strategic importance to it. So they bypassed, went east and then straight into Germany. With the result that the southern end of Holland and the eastern end of Holland were liberated in 1944, in due course, after D-Day but the area, the western enclave which is all the big cities, the Hague, Amsterdam, Rotterdam, Utrecht were the big cities, had to wait till May of 1945, after the Germans capitulated. That winter, which was cold ???, there was not a scrap of food and literally thousands of people died, basically of starvation. And as I said, there's not doubt in my mind that my mother suffered from the after affects of this because she had two boys, 16 and 18 and so every speck of food of course, I really realize that now, you didn't realize that when you were 16 or 18, unfortunately but every speck of food there was around went to the two growing boys. So I think she paid the price, she died in 1947, no it was 1950, 5 years after . . .my father lived to a ripe old 79 so he certainly had great pride. He was at the ??? for PhD degrees, a very public affair. As a matter of fact, your defence is in public, which is a very unnerving experience for the poor guy who has to defend his thesis and there's the whole faculty, all the professors in their black gowns and the mortar boards and all of them can fire questions at you. Of course, fundamentally the questions are related to your thesis but you have to have in there a number of statements, generally a dozen that have very little to do with your thesis but are incompletely different fields. And I think the main reason why they want this is so that any one of these guys behind the table can ask questions and can make a nuisance of themselves. And you have two of your best buddies and everybody is in morning coats and it's a really official affair. And right behind you the room is filled with all your relatives and friends and colleagues and things like that. It's wide open. I still remember this great big hole that was growing in my stomach and getting bigger and bigger and bigger, a very unnerving experience. But my Dad was there

and of course, he was extremely proud. And then actually my brother, because he was older, he started his studies immediately after the war but he was the kind of eternal student. He just wanted to do a little bit of work and then he discovered something new that he wanted to explore. Finally as a matter of fact, he got his PhD degree, it must have ben 2 or 3 years after I had left for Canada. He must have worked on that for 15 years before he got his PhD but my Dad was still there so he saw both his sons, and from his background it must have been an extraordinary feeling. Now that situation has changed quite a bit. And this was not typical just for Holland, I think that was really much the way in all of western European countries but that has changed quite a bit. It's still not as much as it is over here where basically anybody goes to high school you can go to university if you have a little bit of money to pay for the tuition fees. That certainly was not the case and I don't think it is as easy down there even now. But it certainly has eased up from the time that basically only sons and daughters of very wealthy parents could go to university which was very definitely the case in that time. Even shortly after the Second World War. But that has changed naturally but I don't think it's as easy, I often have the feeling out here that we have too many people going to university that maybe do not have the abilities and would be much better off being in a vocational ???.

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HD: Yes. Because it comes back to this thing of what are you good at and what would you enjoy doing. And going to university because everybody should go to university is not necessarily the philosophy that is best I don't think. That may be an old fashioned idea.

TC: No, I think it's a pretty good way to look at it. I look at my own children and my daughter, university suits her very well but my son, he would rather be a chef.

HD: Well, there you go and maybe he would make one hell of a good chef and be happy all his life. He might make more money than. . .

TC: Gosh, I think we've covered my list of questions really well. And I thank you for taking the time to talk to us.

HD: It was my pleasure.

TC: I've enjoyed it as well.

HD: It was kind of interesting for me to go over and remember all these things.