

PETROLEUM INDUSTRY ORAL HISTORY PROJECT  
TRANSCRIPT

INTERVIEWEE: Peter Bediz

INTERVIEWER: Jim Wood

DATE: Dec. 11, 1984

JW: It is December 11, 1984, my name is Jim Wood. I'm at the office of Mr. Peter Bediz in Calgary, Alberta. This is tape 1, side 1 of my interview on Mr. Bediz's career in the petroleum industry. Okay Peter, I wonder if we could start out this afternoon by getting a little personal background and specifically, where and when you born.

PB: I was born in 1914 in Istanbul, Turkey.

JW: So did you grow up then in Istanbul.

PB: Yes, I grew up there and went to elementary school and high school, in fact, I attended university for one year. And then the Turkish government was issuing scholarships, bursaries to send students outside of the country. The selection was based on competitive examinations. So I took one related to geology, at that time, I hadn't even heard the word geophysics, and I was one of the lucky ones, I won and they sent me over to Colorado School of Mines. There is an interesting feature, I'll cut it as short as I can. I was initially supposed to go to Germany to start coal-mining and at that time, this was in 1936-37, at that time, Germany was the greatest country in the eyes of the Middle East countries, including Turkey. And they told me I was going to Germany, and then they called me into the office and they said, we changed our mind, we're going to send you to Golden, Colorado, in the United States. In those countries, you don't ask any questions. But after I finished my work and graduated and got to know the people, I found out that what had happened, somebody else was slated to come to Colorado School of Mines but he had a real good influential uncle in the government so they changed his place with mine.

#025 JW: So that worked out to your advantage.

PB: Yes. You know, the war broke out, that guy couldn't finish, he had to go back and he... he finally finished apparently. But anyway that was a lucky break, I consider.

JW: What was your father's occupation?

PB: My father was a photographer, he had a studio as well as importing photographic cameras, material and so on, and selling it. He had, at the time, he had the largest studio and he was the very first Turkish, in parentheses Moslem, photographer. As you know, the Moslem doesn't accept photography, it's a sin because you are interfering with God's business. And he's been stoned, his studio, in those days you didn't have electricity, you had glass enclosure studios to take pictures and his studio was stoned and the glass was broken and so on.

#035 JW: How did that affect you growing up, was there prejudice against you in school or.?

PB: Oh, it wasn't something that happened every day, it happened from time to time and he

was quite careful not scaring us with these things, he was quite casual telling us. In fact, we found out more about it afterwards. So I can't say it had any effect in my life at all.

JW: How was your preparation, in terms of your education in Istanbul, how did that prepare you for the Colorado School of Mines.

PB: Well, it prepared me, if I may say so, better than the American kids having gotten out of high school. For one thing, it was a 12 year course and the last year was an elective year, you either went to, what they call philosophy or the sciences, where we had math and physics and so on, concentrated one year. The reason I am saying that, I have a definite proof for it. When I applied to Colorado School of Mines, the credits I had in so called high school, which is really closer to a junior college.

JW: Well, yes, because you were 22 years old.

PB: They gave me credit for a lot of first year courses, which suited me fine because I didn't know enough English, or any English, so I concentrated on my English and I took some sophomore courses which related to courses which didn't have to have much conversation in it, like geology. Like math was simple because you had to put the equations and solve them, you didn't have to talk too much. So that worked out real good. And at that time, I was amazed to see the limited knowledge of the American kids that had come to. . . they were teaching them spelling in university. That really floored me. After all, in 12 years or 11 years or whatever, you should learn how to spell words.

#057 JW: Apparently it hasn't changed that much. How did you, in Turkey and Istanbul, get an interest in the earth sciences, in geology, how did that come about?

PB: Well, I was interested in the technical area, not specifically geology and so on. My father's business had gone bad, he couldn't send me to college, so I was on my own, in fact at a very young age, something like 10, 12 years old. And I was taking these competitive examinations that had. . . they were related to technical matters, like even the railroad engineering, ship building, I took those examination as well as this one. Now geology interested me at that time and here was my opportunity and the organization to which I was to return and work had a very good reputation as a job later on. So all these things. . . and coming to the United States, that was a bonus too.

#071 JW: When you got to Colorado, how did you involve into the geophysics aspect of the program?

PB: Well, I mentioned a little while ago my interest in technical matters, math, physics and so on and so forth. Mind you, at that time, geophysics was a relatively very new science. In fact, the school, even though they had a special course of geophysics, they would not give you a diploma in geophysics, to protect you, because they didn't know what the future of geophysics would be. The practical application of geophysics started in the United States when Carl Hyland came from Germany in 1927, 1928. So I was there about 8 years after the first application of geophysics was and it was not an established science. There was a feeling, which continued for many years, that once you survey one area that's if, you don't need it anymore, which turned out to be false. We go back and back as the technology advances, everybody knows that. So while I was taking geology, of course, we

were very close to the geophysical department and as a geological engineering course, we also had to take some preliminary geophysical courses. Well, with my desire and interest in math and chemistry and technology, well I kind of switched to geophysics, even though I still continued my geology work because I liked it too very well.

#089 JW: You mentioned Dr. Hyland, was he there when you were there.

PB: Dr. Hyland came to the United States around '27. He was a representative of a torsion??? balance, which evolves to become a gravity meter today. The principal's the same only it was different instrumentation. Then the Colorado School of Mines was the very first school that recognized the potential of geophysics, so they set up a Geophysical Department and the only person know in the United States as far as geophysical was concerned was Dr. Hyland. So they brought him over or he came over to Colorado School of Mines. And he was there when I joined in 1937, he had been there for a few years, I'm not sure how many years but not too many I'm sure. He was a very knowledgeable person. He was one of those scientists that, he was also a businessman. He set up the Hyland Research Corporation, made instruments and light flashes for cameras, he had the first one. . . , and then he sold that. I did my Masters work under him too. The only problem I had with him, he was so involved with his business, he couldn't give me enough time. He would come and lecture and then I would start talking to him after how my project or thesis is going this way. . . , oh Peter, I just got to go now, but tomorrow I'll be here. That kind of stuff, that went on and on and on. But he squeezed a little time, he helped me on the load.

#109 JW: Were there others there that. . . ?

PB: Oh, yes.

JW: Who were some of the other professors there?

PB: There was Darth??? Wantman???, he died too. And a fellow by the name of Morris Strip??? but he was a graduate student at that time and he was sort of an assistant to the professors. He wasn't really a professor. He got his degree and he got out of there. So actually there was just two men in the department, with the support of the geology department of course, and electronics and physics departments at that time.

JW: Who had the foresight to bring Dr. Hyland over from Germany in the first place, recognizing that geophysics was . . . ?

PB: Well, he came, like I said, as a representative of Escania???, which was a German company that built this torsion balance. So really that was a sales effort on the part of the German company to send Dr. Hyland. Speaking of Dr. Hyland, this is off the subject a little bit, the interesting thing is, you know, during the war, it's very important to degauss??? the mines or the ships, so that they won't be hit by the. . . He did that during the First World War for the Germans, of course, he was a German citizen, then in the Second World War, he was very busy with degaussing??? research and applications and he did it for the United States.

#128 JW: Would you say then, that he was sort of the father of geophysics in North

America?

PB: I would say he is, yes he would be one. There was no geophysical prospecting textbook in the United States. At the time he joined Colorado School of Mines, there was no other school giving a geophysics course. He was number one in that. He was number one in publishing the book, which I have it here, incidentally. The book, in all fairness, and in an unbiased opinion, I must say that he had translated a lot of articles and things from German. In fact, when we were going to school, when I was taking lessons, courses under him, he had all these mimeographed sheets and they said so, translated from this and that German paper. He put all those things, of course, he improved on it, and graduate students helped him and he put out that first book. It's amazing, right after that, there were two or three other books come out. But he was the first one. So on the basis of a) coming to the United States and trying to promote geophysics which at that time was limited to tortion balance and b) being the first professor in a school where it was the only school giving the course plus publishing his textbook, I would say you can call him a father of geophysics in North America.

#148 JW: What was the German motivation for the application of geophysics. They weren't looking for oil themselves were they, more in the mining. . . .

PB: Mostly mining and salt domes. You have a lot of salt domes in Germany and this tortion balance, like gravity meter today, it works very satisfactorily for potash, salt deposits and so on, the study of salt domes, etc. But you're right, most of it at that time, in Germany, was the application for mining. Also for oil and gas but at that time, it wasn't as important.

JW: Did he come over here recognizing it's application for petroleum.

PB: Oh yes. He was a good salesman.

JW: So that was his intent at that time?

PB: As you know, in the early days of oil exploration in the United States, which was more or less restricted to the Gulf Coast area, Texas, Louisiana, Mississippi, and the biggest oil fields and the most important ones were related to salt domes. So the gadget he had, tortion balance, lent itself beautifully and there were many, many discoveries based on that. That's how the thing took off.

#164 JW: This goes back aways I know, I wonder though if you could just briefly talk about the courses and course work that you had in geophysics and perhaps with respect to some of the basic principals that were taught at that time.

PB: All right. First of all, as the word implies, in the science of geophysics. . if you want to call it science, some people like to call it art. . you have geo- geology, or in other words, the earth and physics, physics of course. So you have to have supporting background information in math, physics, chemistry, electronics nowadays, in the old days, electrical engineering. So we had to take these courses, naturally, if you were taking a geophysics course, these were support courses. Now as far as geophysics itself is concerned, it hasn't really changed very much. I notice, I keep in touch with Colorado School of Mines on their advisory board and so on, there is a general geophysics course that is given to those

who are interested to take it as an elective, or the geologists must take it so they know a little bit about geophysics. Now that's sort of a superficial course, it covers all the main four branches of geophysics, which I'll come back to. Now if you were in a geophysics option, as they called it, and the reason they called it option, because of the questionable future of geophysics at that time. Now they are giving geophysical degrees but at that time they didn't, but if you wanted to, the school would certify that you had taken the geophysics course. And when you take geophysical engineering, other than the support courses, you had to take mainly, four branches of geophysics. One is electrical prospecting, the other one, seismic, magnetometer and gravity meter, that's the fourth one. So you had an option, you had to take at least one of those courses, but to graduate, if you didn't take at least two of those main branches you had trouble graduating. So it kind of indirectly forced you. Seismic had more application in oil and gas and the interest in the United States being that, this is where most of the people concentrated their efforts. I've taken all those four courses, myself. They were divided into semesters and so on. Electrical prospecting included well logging as well as ??? and cell potential, and so on. That's still being used.

#211 JW: The name Dr. Dicks and John Legge came up the other day, were they also influential at that time?

PB: Dr. who?

JW: Dicks.

PB: Yes, he was in California, I think Cal Tech. And then a period of time with United Geophysical. He was very progressive, he has published a book and recently he updated it. He's one of the earlier recognized geophysicists in the world really. His main contribution as I understand it, he wrote a sort of a manual for geophysics, especially seismic for United Geophysical people, which, they had a relationship with Union Oil. They were part of it one time and they separated and so on. And that was used as a bible. As I mentioned before, there was only Colorado School of Mines that gave geophysical courses and the early days, even continuing up to late 60's, early 70's, we had a lot of geophysicists who had taken civil engineering, agricultural engineering, physicists and so on, and they learned the trade the hard way, by actually working in the field and in the offices. So there was a need for that type of people to have a kind of geophysical bible and from that viewpoint, Dr. Dicks' contribution has been really important, especially for United Geophysical people and their training and day to day operations.

#242 JW: Do you recall approximately when the first edition of that manual came out, was published.

PB: Now, Dr. Dicks is later than Hyland. If I'm going to guess, I would guess mid or late 50's.

JW: Oh, fairly, quite a bit later. Okay. You got a B.S. degree then?

PB: Well I got a Geological Engineer from Colorado School of Mines with a geophysical option. And then I have a Master of Geophysical Engineering, again from the same institution.

JW: What was your motivation for continuing on with the Masters program?

PB: Primarily the desire to learn more, to do more work and be exposed to professors on a closer basis which you do in a graduate school. You can sit down and have coffee with them and talk science and so on. And the secondary reason was I had plans to go back to Turkey, which I did and over there, in order to have what they call a high degree engineering or whatever, you had to have a Masters degree, otherwise you could be taken for a technician. So it was necessary for me to have a Masters degree. After the Masters, I continued on, I went to MIT and so on. That's purely for my own desire.

#266 JW: What was your thesis topic, your Masters thesis?

PB: It had to do with electrical methods. It had a long, long title, I forget now. It had to do with induced polarization on the tabular??? form ore bodies, eddy currents and so on and so forth, which was interesting. Dr. Hyland wanted me to do that because he was doing some basic work on it himself.

JW: You hadn't then really focused on the petroleum industry at that time yet, had you?

PB: Well, I had worked in the summers in the petroleum industry, on field work, field office work more primarily. So I did have some exposure but even then, I don't know, for some reason I liked to do that. . .

#280 JW: Were there some students that you were with at that time that also went on to be geophysicists in the petroleum industry?

PB: Oh, yes, we had approximately 18 students in our class. I would say, maybe 95% of them went to the industry, various oil companies hired them. That was no question, at the time I graduated, '41, geophysics was well established.

JW: You mention then, you went on to MIT for a Ph.D. program and I understand also, you didn't complete that. What happened there?

PB: No. The main reason for that is related to the war. As I told you I was sponsored by the Turkish government. They wanted us to go back to help them but because of the war, we couldn't go back. Finally they made arrangements, we went back during the war, the last days of VE day. In fact we were in a convoy and we were attacked by the German submarines since they hadn't had the word. But when we left New York, the war was still going on, we were out at sea about 2 or 3 days when we heard VE day, that the Germans had surrendered but the submarines hadn't heard that. We made the trip and we didn't know our destination, it was a big secret. And they dumped us in Port Sahid??? and from there we found our way to Turkey.

#311 JW: That must have been interesting. Had the U.S. government, were you immune from being drafted during that time or were they. . .?

PB: You did have the option of refusing to serve in the United States Armed Forces. Everybody had to register, the selective service act of 1940 or 41, I guess it was, so I too registered, like, all the aliens, everybody had to register, a certain age group. Now in one form they said, are you opposed to serving in the defense of the United States and so on and so forth. I said no, I don't oppose. Those that had opposed, they didn't have the right to come back to the United States later on or become an American citizen. But at that

time, I was working in the field for oil exploration and I was classified as an essential worker, so I was getting these deferments every six months or so. If I were not in an essential industry, then the government had the right to draft me in the selective service group. But I got these deferments, occupational deferments.

End of tape.

Tape 1 Side 2

JW: Just a couple of more quick questions on the. . . before you went back to Turkey, you mentioned the other day there were certain advantages in actually not completing your Ph.D. in the long run.

PB: Well, I didn't mean to say advantages, if I did, I'm wrong because for people that have a certain objective and goal, a Ph.D. is a wonderful thing to have. I was always interested in the application area of technology, therefore if I had finished my Ph.D., I look back and think that most likely I would have ended up, either in a research lab or become a professor or assistant professor and so on. Comparing that to what I have done, now I look back and say well, maybe it was a blessing that I didn't. I came awfully close to finishing it.

JW: What was your dissertation topic?

PB: It was coalinite??? deposits in Turkey, there is a very famous coalinite, one of the better quality deposits there. As high as 52% cormium??? oxide  $CR^2O^3$ , which is found very, very south, in the South Africa, there is something like this. We understand some Russian mines have that kind but the Turkish one was practically on the surface. So that was my thesis, which I wrote the thesis, I didn't have a chance to defend it and finish it though I came awfully close.

#019 JW: You could have done that without going back and done field work in support of that?

PB: In fact, I think I could have probably finished it before they called me back. What happened, we were expecting our first boy and we were living in Boston of course, MIT, and didn't have no money. So in the meantime, the company I had worked for inundated me with telegrams and telephone calls, what have you, come work for us, and they made such an offer. And I said okay, I'll come just for, what we call two quarters, which is less than six months really. And once you get away from it, you don't come back, you say, maybe next year and so on.

JW: Maybe you could just outline real quick, some of the summer employment you did have while at Colorado School or MIT?

PB: Well, the summer work was just working for a contractor, some field work. In those days people believed in, even graduates, to work in the field like a laborer before they moved them up. Then after the field work, after helping them in their laboratories, they put me in a field crew office involved in interpretation, the elementary basic part of the interpretive work. And then gradually I became what they call a Party Chief, which is both manager

of the operation of the crew and man in charge of the interpretive work on the crew. So that's the way it went in those days.

#037 JW: Would you say that your academic training prepared you for real life work experiences?

PB: Definitely so.

JW: It did?

PB: Right, I couldn't have done it otherwise. And especially in a practical application viewpoint. Colorado School of Mines, they don't go heavy on the theory, they give you theory but it's not like MIT, it's a different thing, MIT is theory, theory, theory. Whereas the Colorado School of Mines, they were very practical minded and they treated the student to make him understand and to make him work under the severe conditions at the oil companies. . . , industry. . . , work under pressure, work with as little material as you can. Use your head, solve the problem, sort of thing. So because of that I am very, very indebted to Colorado School of Mines, they prepared you for that. That's why Colorado School of Mines graduates are well accepted in the industry, they are sought very heavily by the industry, even in the rough times. They have casualties too, but nothing like some other schools.

#051 JW: Well, that's unusual. Most often you get such a theoretical orientation and then you get out in the workplace and you can't function without having to start at the bottom and work up. That's interesting. I wonder if we could maybe just, a little more personal background quickly, when did you get married?

PB: I got married in 1942 and I had three boys, children from that marriage, which was dissolved some 14, 15 years ago and I remarried when I came back to Canada and no children from that marriage.

JW: I wonder if we could just talk a little bit about geophysical operations or seismic operations in about 1941 as you were actively getting involved in the business and maybe even go back a little bit and if you know when the first geophysical crews were operating in the States and some of that background?

PB: Comparing to what we have now, the 1940's or late 30's, the instrumentation and field methods were very, very primitive compared to what we are doing today. It was, when I started that we went from what we called 12 trace recording to 24 trace recording. We started shooting what they called split threads, you have the shot point in the middle and then your geophones are on each side of it then. That gave you continuous coverage. While I was working, I had to tie some old work to those days operations and I dealt with six trace, what we call, string galvanometers, which means. . . , mind you those days, everything was on paper, all the recordings were done on the paper. Six trace string galvanometers, what it meant, the background was black and the tracers were white. Now you try to work with those, your eyes really go crazy. So when I started they had improved from that six trace black background, string galvanometers, to mirror galvanometers, which the image is white, pardon me, is black on the paper on a white background. The technology of course, for that time, it was improved but relative to this,

it was very, very primitive. Mind you, we found a lot of oil with those records. They served the purpose just like any other field of technology, the evolution took place and the last ten, fifteen years, the changes were just dramatic. In fact, revolutionary. And what made that possible was really magnetic recording and computer technology. That opened the field for many things.

#092 JW: Well, we'll talk about that a little later on. Did the oil industry readily accept seismologists and geophysicists in 1941? Did they . . .

PB: Oh yes. They were in demand, in great demand in fact. And there weren't as many geophysicists at that time as there are today.

JW: So pretty well upon graduation. . or not graduation then, but leaving MIT, you returned to Turkey, right?

PB: Yes, I did have an obligation, they sent me to school. And I went back there and helped them to organize their geophysical department. Mind you, they had done some geophysics before, they had used a seismic contractor for something like two months, CGG, which is a French company and they had done some electrical prospecting for minerals and so on. But they didn't have a geophysical department, nor did they have field crews of their own. So I helped them, with the other fellow together, to set up their geophysical department, emphasizing the seismic but didn't ignore the others. And we trained their people and they took off from there, they are doing very well now.

#110 JW: There were some students that came over on this plan that didn't go back, is that true?

PB: Some of the government students like myself, they elected to stay here, no they didn't go back. Some paid back the government for the expenditures, some didn't even bother doing that. But I personally feel a hell of a lot better having paid my debt. I sleep better at night.

JW: Well, that was a wonderful opportunity that came up.

PB: And it gave me something interesting to do. I ordered all the seismic instrumentation equipment from the United States. Mind you I'm at that time, a new graduate with some field experience, some interpretive experience, but it wasn't easy. I had to do a lot of thinking and looking up in the books and so on. What to order, how much to order, spare parts and so on and so forth. Also, start comparing prices, quality and so on. Which I have done before I left the United States, they had asked me to do that. I had begun work then when I went to Turkey, I ordered the instruments for seismic, including the drilling units. And we got them there and put up the work and trained the people. We also hired some contract crews, turned out to be United. I should say this. . ., they weren't my choice for various reasons, we won't go into that, but the government people when you deal with them, they said, we want them, I said, why do you want them. They said that's Herbert Hoover's sons outfit, he was the president of the United States, that's his son. I'm saying this to express the philosophy of some of those countries. Herbert Hoover had long gone and his gone Herbert Hoover Jr. was getting pretty old at that time, but because of that relationship, regardless of the price, we're going to get Herbert Hoover's outfit, period.

That's interesting I think.

#141 JW: Oh, sure. Well that's typical political thinking anyway, even today.

PB: And mind you, United played that up too.

JW: Oh, I'm sure they did, in promotional brochures and everything else. What was your participation in the Marshall plan then at that time?

PB: Well, let me tell you how it all started. I had met my obligations and I was ready to leave the country, Turkey. About that time, the American aid people came into Turkey. Well, I knew a lot of American embassy people and some military people and there was a big cocktail party given, which they were kind enough to invite me to some of those. And in that party I met a fellow by the name of Mittendorf???, they called him Mitt as a first name, nickname. We started talking over a glass of whiskey and so on and he turned out to be the head of the mining, petroleum industry department of the Marshall plan, which was officially called Economic Cooperation Administration, ECA. So we talked and I told him what I did in the past and schooling and so on and he said, I want you to work for me. I said, I've got my passport, I'm leaving two weeks from now. Nothing doing, I want you to work for us. I said, I can't do that. So after the cocktail party, he asked my to come see him, he insisted, I refused him. And finally the head of the mission with an Ambassador rank, Mr. McJenkins??? his name was, he called me. Anyway he put the pressure on me, so I said okay, six months and they said all right and they kept their word. So I worked with them six months, maybe seven and then I came back to the United States. So that's how I started. They met me, recognized my past experience, they needed me. My job there was to evaluate, especially the mining properties. ECA or the Marshall plan, being a government entity, they were very careful not to get involved too much in oil business. And there was no aid given to oil companies, there was no such thing anyway, it was all government organizations involved in oil exploration. So it was an unwritten law that we were not going to be involved in oil business. This is of course, lobbying from Washington and so on, so the big major oi companies. But the mining was a different story and they were willing to give them technical and financial aid if they needed so, but you had to evaluate the mine, see that it was worth it and find out the circumstances and so on and see if it would fit into the rules and regulations. And that was my job, I had to go to these mines, meet the people, the operators, evaluate their technological capabilities, technological performances and see whether or not an American help, both money and technologically would help them. So I did that, mostly it was related to mining properties. The idea was excellent, however the red tape was so terrible that I would report to my boss, he would report to Mittendorf, da, da, da and then he would go to Paris where the ECA headquarters for the world was. Same thing, da, da, da, and then Washington, same steps and the answer came back through the same steps and by the time we got the money and approval for technological aid, the guy either had solved his problem or he had gone bankrupt. So it's unfortunate but when the government is involved, they can't act fast enough to do as well as they intend to do. But those were the rules and regulations, we followed them.

#209 JW: Just getting back to real quick, the United States during World War II, was there a decrease in activity in geological exploration at that time because of the war?

PB: No, if anything, the intent was to increase the activity. But there were limitations. The defense program had the priority on goods and services. To build a seismic unit for instance or a drill, you need steel, you need electronics and so on. Even though they made special arrangements and so on, there wasn't plenty of those things, so there was some limitations imposed because of the war in getting many more seismic units. Plus the manpower, because the ones that hadn't studied or were just beginning to study geophysics, they were in the army. And others were busy doing the coordinating activity, so there weren't enough people and that's when, for the first time during the war, we started using ladies, girls in both office and the field work, which was quite a change. Surveyors helper lady, now it's a normal thing, they have them on the crews now, but those days it was a different thing.

JW: Did that change when the war ended. Were the women off the crews then or did that. . . ?

PB: Yes, it did. But I don't think they're as advance in the United States utilizing women in that kind of a job but they do have them, but I don't think as many as we utilize them here. This company I was working for, recognizing this problem, in their own area of course, they asked me to organize a course, real fast three month course, and train people, including women, which I did three or four times. At least we gave them a basic understanding so we could send them out to the crews and it worked very nicely, that little bit of formal exposure because on the job, the guys are busy doing their own job, they don't take time out to explain. Go get this, or drop this and so on, they give orders and he has to think why and find the answer. So I think this answers your questions too, that the manpower problem was very serious during the war.

#253 JW: Were there any technological advancements in geophysics that came out of World War II?

PB: Oh, yes, in the electronics area especially. And later satellites and things of that sort. Primarily or most importantly, it came out with instrumentation much more effective and physically much more smaller which helped our mobility to going to remote areas, that you didn't have to carry all this weight. And reliability. Because technology, on depends on something else. Transistors helped. One compliments the other one and before you know it you have a tremendous improvement.

JW: What year then did you, after your six or seven months with the Marshall plan, did you come back to the United States?

PB: I left, the war was over in May '45, I came back the latter part of '49. Now in the meantime, this is strictly personal, but in order to get out of Turkey, get a passport, for a relatively young man like I was at that time, you had to have your military service, which is compulsory. So after all this, before I started ECA, I already had it because I had my passport, I had to go to the army. But luckily for me, instead of serving 2 1/2, 3 years which was the common duration, they ran out of money so they gave me an Honourable Discharge in a year and a few months, sixteen months, seventeen months, something like that. And then this ECA came and I worked there and then I came back in '49.

#296 JW: Did you have a firm job offer when you came back?

PB: Strangely enough, no. I had trouble getting a job, with the experience and the scholastic background, because it just happened right at that time, there was a recession. I'd been hearing how badly they were looking for people, when I was in Turkey, from my friends going back and forth. I talked to a lot of people in the United States and they said, gosh, I wish to hell you were here three months ago, we've got orders, we can't hire anybody, there's a recession going on. And I didn't want to wait. I wanted to go in with an oil company but I ended up with another contact which was Century Geophysical.

JW: I take it then, had you heard of the Leduc discovery or anything when you were in Turkey?

PB: Yes. But you know, when you are not in this country, that's one spot, someplace in the world. We heard it but I didn't realize it's importance, and I am willing to bet a lot of people here didn't appreciate what it was going to lead to. Yes I heard it, because of technical journals, I was getting those, no problem there.

End of tape.

Tape 2 Side 1

JW: 1949 the, you went to work for Century Geophysical, I wonder if you could just talk a bit about that company at that time, where they were and how big they were and the nature of their operations

PB: Well, at that time, Century geophysical had a total of 4 or 5 crews in the United States and maybe 3 or 4 in Canada. The founder of that O. B. Dimic???, his name is, came from Carter Oil which was the Jersey Group at that time, they keep changing their names as you know. It's one of the branch of Jersey, very active. And he had left that company and started his geophysical and he hired a very good instrument man and he build some, what we call Sanctuary 501 amplifiers and a camera and it was, for that time, the most advanced instrumentation. And one interesting thing to remember is that, in the old days, there were several contract companies, like SSC, GSI, United, Western, National Geophysical and so on. But the interesting thing is, they all designed their own instrumentation and they guarded their secrets very carefully, they would never sell their instruments to anybody else, except in special occasions. Now like I said, when I was in Turkey, I was over there, some contract companies were willing to sell me their instruments, provided we didn't use them in the United States. Now some other companies, like SSC, which is one of the oldest companies, Seismic Service Corporation with a counterpart in England now, SSL, they did have a side organization they called ELI, . . . Laboratories Incorporated, what was the E for. Anyway they build instruments and they did sell them. They were the only ones but they were not as advanced as the instruments they were using at that time. O. B. Dimic got the idea, so what, I'm going to sell my instruments, they are well accepted, well known. Major oil companies, they usually analyze your instrumentation and they give yes or no to their people. They cannot

hire a crew unless their main laboratory had approved your instrumentation. So they were all for it, in fact, we had contracts coming because of our instrumentation. But he decided to sell them and he did sell the. To make a long story, short, he had real good instrumentation for that time. The only trouble is unfortunately, he didn't keep up. Other people caught up with him and they surpassed him. So it grew, when I joined the company, like I said, they had 4 or 5 crews in the States, 3 or 4 crews here. After that they expanded their operations and up here, during my managing time, we went as high as 16 crews one time, during the winter only. We had the crews but we couldn't operate them, there was no need for them in the summer. In the early days, that is to say from, late 40's to the mid 50's, up here, when you had a crew under contract, that crew was under contract for a year or two. You say, what they do during break-up time, we got paid, not full, maybe 60 or 70%, somewhere around there, depending on the contract arrangements

#044 JW: Sort of a retainer.

PB: Yes. So that they could hold crews because they didn't have surplus of crews for one thing. Of course that changed afterwards. So Century evolved from this instrumentation, building seismic amplifiers and cameras, they started building cameras used in the industry, recording cameras and so on. So they formed Century Electronics Inc. and they were doing fine. In a way, we were paralleling GSI you might say, but on a much smaller scale. And then the electronics company, which was very successful for awhile started going downwards, it became more of a liability, the service company carried them for years and so on. Then effectively in 72 or 73, I left them in 70 or 71, they went bankrupt and new people came in and took the company over. And they're not as aggressive as the old people. They still exist. They are out of seismic work in the United States, they are active here as a seismic contractor. In the States we had developed a very nice logging tool for coal and uranium which was extremely profitable and in great demand because it was good. We had something like 48 crews, mind you, in number of people, it doesn't compare to the seismic. You had 2 or 3 people on each crew whereas with seismic you can have anywhere from 15 to 45. Of course, at that time, in the late 60's, there was tremendous activity for uranium exploration, both for government requirements, atomic bombs and so on and also the industry feeling that you know, power plants and so on, they wanted to tie up the fuel if necessary. Of course, that has changed too now.

#070 JW: You brought up a topic I was going to get onto a little later, but I'll maybe explore this now. You mentioned that Century's equipment was state of the art, very sophisticated.

PB: For it's time.

JW: Well, that's right, relatively, for it's time and that's. . . what we're talking about here is late, 1940's early 50's. I guess I'm under the impression that it might have been almost too sophisticated, say relative to SIE, Southwest Industrial Electrics, whose equipment was simpler and more accepted by the industry.

PB: It's a good example Jim because effectively SIE took Century's business. We went to sleep, we were too proud of what we had. You mentioned the word sophisticated, really

those instruments were not sophisticated, but they had better response to seismic energy, better filtering system, better sensitivity and so on. But the industry and especially SIE, they utilized some of those ideas actually and they came up with instruments that were better than Century's, so Century lost out. In the instrumentation ???, this is what happened to Century. I mention each contract company had their own instrumentation and they would not use anybody else's, if you insisted on it. Now that has changed, every contractor uses TI, which is GSI and so on. That's one of the important changes in the industry.

#092 JW: We're still a little ahead of where I want to be but on the topic, I understand that occasionally there were, what were called shoot-outs, in terms of comparing one company's equipment with another's side by side. Were you involved in . . . ?

PB: Oh, yes, many a time. During the period of time where Century's instruments were far superior to others, we always won and then afterwards we started losing because others improved, we stayed where we were.

JW: So for example, an oil company would call Century and another company and say, come on out and let's compare results.

PB: That's right. This was more the exception than the rule however. In other words, not everybody did that all the time, once in awhile. The main appraisal of your instrumentation, like I mentioned before was done by the oil companies research laboratories. And all the contractors or instrument manufacturers always sent a sample to these companies for them to appraise and then they of course, return them with their comments, sometimes suggestions. And if you were on a list, an approved list, then every district geophysicist had the authority to hire your crew because your instruments were approved by his company. I'm sure they still must do it.

#112 JW: Where were Century's offices in the States in 1949?

PB: They were in Tulsa, Oklahoma, a street called Pine Street, they had their own little building, it was a nice little, cute little building.

JW: But you weren't there very long, were you?

PB: I must have been there 2 or 3 years or so.

JW: A little bit, but then you got sent up to Calgary.

PB: Well, I was going back and forth.

JW: You were even then.

PB: Yes, to coordinate our efforts and so on.

JW: Did Century have an office here in town, in Calgary?

PB: Oh yes, we always had an office.

JW: Well, how was it that you came up on a somewhat permanent basis?

PB: First of all, I came on a temporary basis. What had happened, like I said in '49, Century Oil offered me a job which I accepted and I worked there less than a month. They came to me and they said, we got a two crew contract from Shell Oil in Canada. That's a company we have wanted to get in with for many years but we need somebody, a supervisor, they request a supervisor, that had degrees and experience and so on. You fit that picture real

well, so we want to send you over there if you accept the transfer, just for three months. Get those crews started and then train somebody under you and then gradually ease that fellow in with Shell Oil Company so that you can be transferred back here. So we did that, I came here and I helped to supervise a crew and so on, but they didn't follow the arrangement we had made. They didn't give me anybody to train or they didn't have anybody. As time went on, they said, just for a few more months, just a few more, I said okay, all right, then finally, my family is in the States and I said, look I don't mind being here, in fact I like it. Let's make a decision, I'm assigned here permanently and I can bring my family and they were so happy to hear that, they said, sure of course, so I brought the family here and I stayed here most of the time. Meantime they transferred me back for a couple of years, twice and then with management changes, new people, they wanted me to go to the States as a promotion. I accepted and I think probably, that was the biggest mistake I made. That was '65 I think. So they made me an executive Vice-President of the parent company and then the President and then the Chief Executive. In the meantime, they had merged with a small electronics companies in California here and there and lots of headaches, the company had gotten a little too big and so on, so it got to a point where I couldn't stand the pressure. I always wanted to go on my own anyway so.  
...

#154 JW: Was there someone in charge of the Calgary operation in Calgary at that time in 1950?

PB: Before I came and after yes. A fellow by the name of Jim Zeigler. Jim and I went to school together, his father is a very well known geologist, he has passed on. In fact, he was the professor of geology in the Colorado School of Mines and head of the department for awhile. Jim was his son but something or other happened and he wouldn't support his family, he left home, the father and Jim was going to school but he had to support himself. And he was working at Coors Brewery in Golden, Colorado, so it took him, instead of four years, it took him six, seven years to finish. So I had many courses with him, he was my classmate and schoolmate during that period. But he graduated the same year that I did. And he was in charge here, he liked it here, he had been up here with Hyland Geophysical, which goes back to Dr. Hyland but he had sold it many years before that. He came up here with them and then Century hired him as a manager. He's still alive someplace, I don't know where he is, he got lost recently. But Jim was the manager and I was an assistant manager, assisting him in managing and finally I became manager and the president of the company here.

#179 JW: Where were your offices when you came up?

PB: When I first came up, our offices were 615 - 8 Ave. It's gone now, that building. Remember Calgary Drafting, Cal-Draft.

JW: Cal-Draft sure.

PB: That same place where they were before they knocked the building. Before that I understand they were in East Calgary, a restaurant there. . . Club Cafe, over top of the Club Cafe, I wasn't there, that was before my time. And then from 615 - 8 Ave., we went

to the Examiner building, 5<sup>th</sup> Street and 8<sup>th</sup> Avenue, between 8<sup>th</sup> Ave. and 9<sup>th</sup> Ave., that's gone too. It would be catty corner from Wave Cafe which is also gone. Then from there, they moved down south to 39<sup>th</sup> Ave. on Macleod Trail, they're still there as I understand.

#192 JW: Yes, they are. What was your impression of Calgary when you arrived?

PB: I was very pleasantly surprised, a) the size of town and this might sound ridiculous, but I was really impressed with the Calgary Herald. For a small town, it was a good read paper and I liked the people, I liked the size of town, at that time the population of Calgary was around 90,000-92,000. A lot of bicycles and down to earth people, sincere and willing to learn and I had something to offer them, to train them, a lot of people. Mind you some of it is all forgotten now, but nevertheless I'm still happy that I've done it. I never cared for the winters but no matter where you are you have a certain season during the year that is not the best so I didn't mind it that much. That was the only thing that kind of scared me. I got off the plane, it was 30 below or something.

JW: Oh, you came in in February didn't you?

PB: I like the atmosphere, I liked dealing with younger people, my age people, very enthusiastic, hard-working people and we had a lot of challenging problems in those days. We have it easy now. All these things they enjoy today out in the field, there was efforts made to get to that point. It started with tent camps in the middle of the winter, you know what that means. Now you couldn't put anybody in a tent.

#219 JW: Well, it was also a cohesive oil community wasn't it, and good camaraderie and . .

PB: That is very correct. It's true that way, what I'm going to say is, Calgary really is the centre of the oil industry in Canada. Every companies office is in Calgary, their main office, they might have branches and so on, and throughout these years I have seen this so-called decentralization and centralization with oil companies. The centralization never worked because they really, truly never decentralized. They'll send the poor guy over there and say, now look, you can make your own decisions, well, the first decision he made he was criticized, from then on, Calgary was the one to uproot the decision. Anyway that's beside the point. So you were in a community, Canadian oil exploration and production community altogether. The Petroleum Club for instance, was at the Palliser Hotel, the top floor, two rooms. I don't think they had more than 40-50 members at that time. You got to know everybody at all levels. You understood the problems that everybody had by talking to them and even up to the late 60's, early 70's the community was relatively small. After Zama Lake??? which was 65, 66, 67, that's when it started getting bigger and bigger. But you still have the people here, it's not like in the States. You have Tulsa, you have Houston, you have New York, Fort Worth, Dallas, Denver, Casper, Los Angeles, these are oil centres. They all claim they are the oil centre of the United States and none of them is anymore, once upon a time Tulsa was but that's once upon a time.

#254 JW: When you came up here with this contract with Shell, they had missed out on a lot

of the early action hadn't they. And they had given up their Redwater acreage. . . ?

PB: This is what I had heard, that they were quite active here and not having any success, they moved out of here totally disinterested, and they came back late 49, early 50, that's where these crews were then. Our people wanted to get on with them, since they knew, once they could come back they were going to stay here.

JW: Yes, I heard a story the other day of Cec Cheshire???, did you know him?

PB: Oh yes.

JW: Sitting all by himself out here, he was the only Shell employee.

PB: For that matter, city service in 1950, they only had one man here, there used to be a flower shop on 7<sup>th</sup> Ave. He had an office there, a room about this size, smaller than this with a slanted ceiling and it turned out to be Ernie Disler??? whom I went to school with. I ran into him on the airplane going, from Edmonton north, and we looked at each other, what the hell are you doing here. But he was a one man operation, later he got a secretary. Hudson Bay Oil and Gas, they were five or six people including the secretary, look at them now. So they all started with one man. Amoco, they call themselves Amoco now but at that time, Indiana Stanlin???, they had Bill Matthews, one man, on 8<sup>th</sup> Ave., he had a little cubby hole there and a secretary, that's all. That was Amoco. That's in the early 50's, of course, it grew.

#289 JW: You hinted at it and you mentioned that Shell at that time were quite interested in degrees, in fact the other day you called them degree crazy.

PB: They still are. I think that's their European influence, as you know, their headquarters are in the Hague, and they're still influenced by that philosophy.

JW: What were you doing for Shell then, what were they after?

PB: They were looking for structures conducive to oil and gas accumulation. Like anybody else, they were also, like the others, were looking for a big, big Leduc type, possible fields. And we were working the Peace River country for them at that time and eventually that crew moved up to ??? Mountain, which is north of Peace River. At that time, we thought that was the end of the world. It's south now. So primarily in the northern Alberta area. They had had ??? crews, they still do I think but they usually use them in southern Alberta and especially in the foothills.

#314 JW: You mentioned Shell was looking for Leduc type reefs, I guess everybody was at that time?

PB: Everybody was. You couldn't get companies to become interested in other possibilities like cretaceous sands and so on, which in the course of the work you were doing for them, for big Leduc type things, you could see some other possibilities, nobody was interested. Everybody was for a big bonanza. That changed, that changed primarily with smaller independents. Really it repeats the history of other countries too, I've seen that happen in the United States as well. Some company discovers a big thing and then a small independent goes and finds the extension. I call them scavengers, and they're successful and that leads into something else and what have you.

#333 JW: But at that time did you recognize in your data and results that there were other possibilities?

PB: Oh yes.

JW: They just weren't interested.

PB: They weren't interested, they wouldn't even look at it. Mind you, some of those, perhaps most of those, were most likely to be gas and at that time, it was 2-5 cents a thousand, if you could find somebody to buy it at the wellhead. So there was no money, no interest. In fact, when you mapped a project and it looked promising, they went ahead and drilled it, when they found gas, everybody was so unhappy, because it cost them more to complete that one and then they couldn't sell the damn stuff, but that changed too.

End of tape.

Tape 2 Side 2

JW: Peter you mentioned you were supervising these crews working on behalf of Shell up in the Peace River country. Where were the locations generally, of geophysical operations when you arrived in Canada? Were they up in that part of the world?

PB: Yes, they were. In fact northern exploration. . . I should define northern at that time, it was from Edmonton north to Peace River country. And there was a lot of activity in that area. There were big reservation given to the oil companies and they were evaluating them. And they were all, like we talked before, looking for a big Leduc type discovery.

#010 JW: At that time, were you finding problems in identifying, say, specific geological events, such as, say the Mississippian in particular areas . . .

PB: Oh, yes definitely so. You've got to remember that at that time, we didn't have as much well control as we do now. So we were in the dark most of the time. And as the holes were drilled, the seismic work and the geological work improved tremendously because we began to know what we were dealing with. In fact, there were many projects that I and my colleagues were involved in, we couldn't identify the horizons, except by, it looks like, it's the top of the Devonian. We didn't have well control to tie our geophysical work, to measure the top and make a map in depth. We were making maps in time, in travel time, which isn't the best way, but it's better than nothing in a new, semi-virgin country. One time we had a crew for Hudson Bay Oil and Gas. It was located in Fort Vermillion area, just a little east of Fort Vermillion and we were there to shoot for Devonian horizon, especially for that. We discovered that what we call the first breaks in seismic work, we were encountering an extremely high velocity, unusually high velocity zone. So I happened to be on the crew and I noticed that and I advised Hudson Bay. I said, there's something funny going here, of course, first we suspected our instruments and so on. We checked those and then when we were convinced that it was not an instrumental problem, we advised Hudson Bay and we said, well there's a likelihood we might be in an area where formation is close to the surface, meaning the Devonian. I think I phoned them from Fort Vermillion and they said, never mind, you go ahead and shoot it.

Apparently that sparked an idea, they looked at it, then two or three days later they advised us, pull that crew out of there, that Devonian is almost on the surface. Well, they meant well going in there but they didn't know. So in answer to your question, there were many areas where we really didn't have enough geological information based on wells drilled to make an intelligent interpretation. That in a way leant itself to looking for big, Leduc type, reef build ups. You could see it, it was a big rise there that you couldn't ignore on the seismic records. You couldn't tie to any wells or anything like that, you were in the half darkness.

#046 JW: In terms of the cost of fielding the crew, say in about 1951, do you remember what

it would cost then compared to now. . . ?

PB: I certainly do, because I was interested, especially since Century was manufacturing instruments and so on. You could have started a crew, instrumentation and everything, except the drills, which you could sub-contract, for about \$25-30,000. Now if you had \$5,000 you could make arrangements with the bank or with the manufacturer, pay him so much a month sort of thing. So if you had a capital of, say \$10,000, \$5,000 already is for instruments, the other \$5,000 operating expenses until you start getting income, you could have started a geophysical company. Nowadays you are looking at a million or two for the same thing. Mind you the instrumentation of those days was much more simpler, whereas today, it's much more complex. You can say the same thing with Model A type Ford versus 1984 model Ford. Model A you could open it, you knew what was in there, today I open it. . . .

#063 JW: Well, we're going to talk a little bit later on about instrumentation and techniques and so forth. Did a lot of fellows start up shoe string operations at that time, with \$5,000 and go to the bank for the rest.

PB: Not as many up here as in the States, in the States, yes. In fact, there were some investors, I know of at least two, that gathered some people as key personnel, supervisors and so on, and they committed themselves to buy instruments for them with the provision that they would pay them so much for the instruments and they put them into business, independently, yet they were all owned by one person or one company.

JW: This was down in the States?

PB: That's down in the States. In the States, this has been quite common. I know many, many cases. Some have done well and got big, some lost their shirts, some built it up to sell it to another company and they did. Some with no intentions of selling, the offer was so good, they were so disappointed in themselves that, here's our way out, so go ahead and merge with a company.

#077 JW: Was Century a public company or. . . ?

PB: Yes, it was.

JW: Did you even get the entrepreneurial spirit during that time to go out on your own?

PB: I always thought about it Jim. But by nature I'm a very loyal person and I hate it. . . , a

company that helped me to get where I am, to step out and start competing with them. That's one thing and secondly, I had a young family and I'm not the risk taking type so I figured well, it's good to have a paycheque at the end of the month.

#085 JW: I found that interesting, you mentioned in the States in '49, there was a bit of a recession and I take that to mean also in the oil and gas business. Where somewhat the opposite was the case here at that time, there was quite a boom in activity.

PB: The problems were different. . . or the potential here was very promising, whereas in the States it wasn't. And also as you know, any economic upturn or downturn takes at least six months to get to Canada, plus or minus, whichever way it goes. But I think the main reason for that was, this was a new country, new potential, everybody recognized that, people that knew about oil business recognized it. And you must also remember that at that time, we had big, international major oil companies active here. And those companies, they plan for 10 years from now, 25 years, 50 years from now. And having recognized the future potential of Canada, they were not about to slow down here. Some of the government regulations had pushed them to continue exploration work, otherwise they would lose their reservations and so on. Most of them kept it within a year or eighteen months of expiration anyway, so they had to do something. And in the States, there was plenty of oil, there was a problem marketing your oil. There was a lot of oil, there was no shortage of oil, it's not like now, anything you produce you can sell. And the emphasis there was given to wherever the pipelines were, the population, the refineries, try to find something there. And being a country in which you had many fields already discovered and producing, there was no concern about falling too far behind. And these recessions, most of them were 4, 5, 6 month durations. I just happened to be coming at that time.

JW: Oh, just little oscillations.

PB: After that it opened up. In fact, I think in '51 or '52, there was a period of time where the number of crews were increased to unbelievable numbers and then it dropped again afterwards. We didn't feel any change like that here until the early 60's.

#121 JW: Well, that's what my impression was, that with Leduc, Redwater, Golden Spike, Drayton Valley, it was a fairly sustained and almost hectic at times, frantic amount of activity. Did that lead, during that period through the 50's especially, to technological evolution in the seismic industry as well, did that kind of stimulation in the business lead to stimulation in the technology? Is there a relationship at all?

PB: I'm sure that influenced things. Another factor, quite important, Canada versus U.S. at that time, everybody was going to other countries from the United States, Saudi Arabia, Kuwait and so on. Because they used to claim they were producing oil there, about 10 cents to 12 cents a barrel. Of course, the Arabs smartened up afterwards. But the philosophy was, especially from the financial type of people in the big oil companies, which they direct the policies really, if you can find it there for 12 cents, why should you find it here for \$1.50. Incidentally based on the publications, like Oilweek and before that, that other fellow had one that Oilweek bought him out, based on the information we got

there, the cost of finding a barrel of oil in Canada, despite our logistic problems was considerably lower than finding a barrel of oil in the United States. So that was another incentive.

#143 JW: Why?

PB: Well, first of all, down there you are dealing with land owners. You have a lot of expenses getting the land, the royalty was 12 ½ % standard for those days. Whereas here you were getting a big reservation with the government. And I venture to say that royalties and the cost of getting the reservation, and you were looking for big things too, was conducive to the oil companies to spend more money here. And the local requirements were. . . , see we were importing a lot of oil from the United States in those days. Now we are a net exporter. So there was a market here as well. Whereas in the States the market was saturated. Remember all the States had their pro-ration, you couldn't produce more than 20 barrels a day because if you did the price of oil would go down and people wouldn't have enough money to explore, that was the idea. Now we had pro-ration too, here, but not as drastic as the United States. The pro-ration here is based primarily, on the life of the field. The faster you take it out, total amount will be less in the long run. If you take it a little bit at a time, it will last longer and you will get more. Now this is one thing a lot of those Arab countries didn't know, they were pumping it out, as much as you can while the going was good. So they really, for a period of time, the companies neglected the United States exploration work because they were too busy in foreign countries. Some try to rationalize that, well it's still in the ground in case of emergency, we can come back here, why don't we get the other oil now that we can. That's an argument.

#174 JW: Well, the U.S. Navy??? has and had all those big reservation. Well, too, I wonder if World War II and the exposure so many people had to different parts of the world helped to open that up a bit but that may not be true as much either because Shell was involved in Indonesia. How was seismic work handled by the oil companies in the early 1950's, I understand it was different than it is now?

PB: Yes, it was quite different Jim. With most companies, a contract companies crew was regarded as part of their own organization while they were under contract to those people. And these contracts lasted for months and years. So the longer the time, the closer the people got to each other, the contractor versus the oil company people.

JW: So with you and Shell for example. . . .

PB: Right, as long as you did a good job, they protected you in any way and every possible area. There was no such thing as dropping a crew and picking up a crew because it's closer to my project. They had planning in such a way that we'll finish this and then we'll move the crew here, when they are there, they'll do this and this and that. From another aspect the difference was that the contractor had an interpretive staff on the crew and they were in charge of coming up with an interpretation. Mind you the oil company did their own as well, some of them did, to check against each other. At that time, the seismic contractor was more involved in interpretation, therefore they were more. . . the technical

aspect of it, they were involved in it. Today it's really a labour and equipment contract. They are data gatherers period. You go out there under given specifications, they gather the data and turn it over to the oil company. Whereas before the contractor itself worked the records and so on, interpreted it, made a map or two or five. I think that is one of the biggest differences. Now why did this happen. Primarily because of the computer technology. You had to bring the records in here to the data centre. Once you do that then the data is already here. But in the interim period, there was a transition period from this, the contractor was asked, instead of having a Party Chief, who was in charge of the management of the crew as well as interpretation, it evolved to a point where we put what we called the Party Manager. He was a good field man and we moved the Party Chief, then we called them seismologists, into the town and they still did the interpretive work and they were in closer contact with the client because they were in the same city, Calgary. But eventually that disappeared too. Part of this, in all fairness, some of the contractors did not have well qualified people to do the interpretive work and naturally the oil companies began to think, what the heck, we're paying for this service, which they were and we're not getting anything, we still have to do it and we don't use their maps, we throw them away so why pay for them. So that contributed to this separation of field and interpretation.

#232 JW: It seems to me a great potential for conflict of interest too, if a company were working for Hudson Bay Oil and Gas in a particular area and then they also got a contract that included the interpretation in that same particular area for Home Oil, there's the potential . . .

PB: You would be surprised, this seismic or geophysical industries integrity and the respect for confidentiality, it was amazing. I worked one area in West Texas near a little town called Merdson??? for six different companies, we repeated, we went through the motions of getting new data each time, six times. The reason was, this block of land was available on a geophysical option, that means they give you the rights to shoot it, evaluate it, and then you have the right to sit down and make a deal with them. Okay, the first guy apparently didn't like the possibilities so he dropped it. Another company came in and got it, this went on six times and believe me, we knew the results would be but we went through the very same motions which in a way is stupid. But we shot it, we interpret it, it was easier the second time to interpret it, the third time and so on and nobody to my knowledge had any idea as to what the previous optionee had done. We kept it to ourselves. They were very, very ethical, very conscious of conflict of interest. And it was amazing, dealing with oil company A, they would say, we want to keep this thing secret because we developed this thing and you knew, you had worked for company B, they were doing the same thing and they thought they were the ones that discovered it. But they didn't have communication, confidentiality, and a contractor in between. You just talked to them in their area, never bring anything from the other client that you did the work for. Unless it was published and they would ask us, why do you think we should do that, we know you shot it for company A. Our answer was, yes we did shoot it for company A, why don't you call them and ask them because that's their problem. And

they did, some gave them the information, some didn't.

#279 JW: So even though then, you would do the shooting and do the interpretations, the company that bought your services owned the results. It was their copyright in effect. You mentioned the integrity of geophysicists, isn't it the CSEG, Canadian Society of Exploration Geophysicists, they are the certifying body aren't they of geophysicists.

PB: No. APEGA is.

JW: When did that certification program come in or was that here.

PB: It started around the 60's when they included the geophysicists. Now APEGA goes back for engineers, civil engineering and so forth. But in the early 60's, I think that's when I joined them, '62 or something like that. Now how effective is APEGA, that's another story, I'm biased on that so I won't say anything.

JW: Well, I might ask you about it later on because it's an interesting situation that's developed.

PB: There was a serious disagreement between the geophysicists, geologists and APEGA. It got to the point where there was no respect, no mutual respect for each other and recently they are trying to get together with CSEG, have a liaison committee and so on, they are trying to accomplish certification in such a way that CSEG will play some passive role in it. It hasn't happened yet but it's on the way, it seems like. I mentioned geophysicists integrity, I think you can expand that to include all phases of oil industry. I myself, having been involved in the past with electronics people and others, when I was in Tulsa with Century. . . , with the oil people, you sit down, discuss the matter, you shake hands, that's as good as a written contract. Whereas I found out in other businesses like electronics, it wasn't so. And I was very, very disenchanted because they will deny we had agreed to this and so on. Then I learned with you people from now on, I'm getting my lawyer here, he's going to take notes, you're going to sign it. We don't do that in the oil business. Many contracts, like geophysical service contracts, they are signed and delivered after the job is finished just so the files will be complete.

JW: Even today?

PB: Even today. To me the difference with other industries is very important.

#342 JW: Well, Peter, I think we will call it day with this and pick it up again next time.

End of tape.

### Tape 3 Side 1

JW: Wednesday, December 19, 1984. My name is Jim wood. This is tape 3, side 1, also my second interview session with Mr. Peter Bediz in his office here in Calgary, Alberta. Peter, last time you mentioned Century Geophysical was the first one to start selling their instruments on the open market in effect. What was the reaction of the other companies at that time, to that move by Century.

PB: I think there was mixed reaction to that Jim. Some people thought Century was crazy, they were losing a lot of contract business and other thought that was a good idea. The oil companies liked it because, at that time, with those instruments, they were using Century because they had Century instruments. This allowed them to use other favourite contract companies with Century instruments. So it wasn't a big issue or anything like that but I think the fact that century started selling their own instruments started the trend for contract companies to open their product to other contractors or other companies.

#017 JW: I understand that the first continuous velocity log, or CVL was run in Oklahoma in 1954 by I guess, SSC. How did this affect the identification of events in the development of synthetic seismograms?

PB: It's a must really, you have to have accurate velocity information measured at the well in order to get the reflections, core ??? and so on. Without a log in the hole which includes a velocity hole and also sonic log, actually a sonic log is a velocity, however there are places where, because of ??? and so on, the accuracy is not 100%. So you have to have what they call, check shots, and with the aid of the check shots or the velocity shooting what it is, you calibrate it, the sonic log. Some people seem satisfied, sonic log is good enough, we don't have any [gravitation???], what little calibration you need to do is not going to affect our results, so they went ahead and used sonic log as a velocity log. And it can be done, it has been done. But using the check shots, the seismic velocity surveys, that seismic log becomes much more reliable and refined and with that information and extending that information and intrapolating???, extrapolating any new area that had not been drilled, you had a fairly good velocity information at your hand. It may not be the best one until it's drilled and other velocities determined, but it helps further exploration or exploration at a later date in other adjoining areas.

#040 JW: Did that set off a mini-revolution at all or just part of the continuous. . .

PB: I'm not sure I understand.

JW: Was that a momentous introduction or was it just part of the evolutionary process?

PB: I wouldn't say anything revolutionary because way back we used to shoot velocities before the sonic log was invented. And we were determining the depths to given formations from those velocities so it was not as improved and advanced as it is now just like anything else. But the velocity was done before, maybe the emphasis wasn't given as much as today, but nevertheless it was there, it was used.

#048 JW: To change the topic here somewhat abruptly, the Canadian Petroleum Association did a survey in the 1960's of, I guess the number of American versus Canadian employees. I wonder if you could talk about that survey and the changing ratio in the Canadian seismic business.

PB: I think we briefly touched on that last time we talked. Let's face it, the development of the oil industry after Leduc was primarily due to American companies interest. Of course, they were looking after their own interests as well. We did not have local personnel here

available immediately, with experience. Those who had experience and educational background in oil exploration, drilling etc. in our industry, most of them had immigrated into the United States and had jobs. So naturally some of those people were brought in as the oil companies came in since they were Canadians originally and they knew the country, they knew their way and so on. And some of them were anxious to come back home. Even then there wasn't enough to change the balance. So by necessity in the early days, we had as a foreign interest in this country, I can safely say, more or less restricted to American oil companies. They brought in their own people, that even applies to the contractors, seismic, drilling etc. I remember in the early days, other than ordinary unskilled helpers, we brought in the assisting category from the States as well. Now they were the first ones to be sent back home or they became Canadians, they stayed here. The other more technical aspects of it took a little longer. There was a gradual change over as the Canadian personnel got the experience, got the know-how and understood the philosophy of exploration, which is important, and they began to replace the American people. In the late 50's, early 60's, there was a natural interest among Canadian people to see that their own people did the job. There were little articles and conversations and speeches to encourage that or to see that hopefully, this will happen. Because of the fact that the American companies really could use those people in other places, including other foreign countries and because of most of the companies anxiety to become a good corporate citizen, they followed the policy. This gradual change got to a point now, that we have close to 100% Canadian personnel in charge, on top levels, middle levels and lower levels. This is how it happened. It was a natural growth and there was no resistance by the industry or foreign oil companies. Some were a little slower than the others. Some did not have as much faith in the Canadian personnel, thinking they had not matured as yet. I think if you examine that report, I vaguely remember that report, I brought it up to you the other day, they had different companies, and the personnel ratio, Canadian versus American and some companies had more or less achieved the objective, or nearly so, whereas others were far behind. But that changed too with time. I think this was a natural evolution.

#098 JW: In a similar vein, I understand you also did a survey on your own on the experience

of Party Chiefs and found some interesting differences.

PB: Yes. In the early days, that is to say from after Leduc, the geophysical industry became quite important in Canada, the application of geophysical. . . , particularly seismic. In the meantime the same thing was happening other places, including the United States, so there was really a shortage of personnel. Also we must realize that at that time, as well as today, any well qualified, engineering type of people would not happily accept a job to go up in the bush country. They preferred jobs in big cities and engineering firms and so on. Also at that time, we did not have too many institutions, therefore too many geophysical students or graduates. And this is true up until a few years ago, we had geophysicists came up the hard way, they were civil engineers, agricultural engineers, physicist, mathematicians, even unrelated unscientific educational people, like school teachers. We

hired a lot of them in small towns. There is at least one that I know today, he is holding a very responsible job with a major oil company. Here he was a school teacher in Saskatchewan. We met him there, he liked what we were doing, he joined us as a field hand and then he progressed, he had the ability so became a Party Manager, Party Chief, and seismologist, interpreter and then he left us, went with another company and today, like I say, he is holding a very responsible job in a very big company. So we had those people too, but back to your question, you can see that we didn't have people that had the geophysical college training. Plus the very few that might have been or could have been changed into geophysicists were more interested in getting jobs in the big city instead of going out to the bush. The demand for geophysicists was great both in the United States and Canada as well as other places. So as a result of that, and this coinciding with the expansion of the work, it made the conditions more acute. Therefore we had to trust people with much less experience in much more responsible jobs. I made a survey with our own company, that was Century Geophysical and to me amazement a very responsible job, Party Chief's job, which at that time, not only he was the administrator of the crew but he was also in charge of interpretation and he did interpretation. Their Party Chief experience, I don't mean to say their geophysical experience but their Party Chief or interpretive experience, in our case was somewhere around 4-4 1/2 months, which was really ridiculous. And then I inquired around informally with other contractors, with whom I got along very well incidentally, and they confessed that yes, their experience hadn't been any better than ours. Of course, that has somewhat changed now. The nature of the responsibility has changed too. Interpretation has come into town now, so you can get better people. And the computer centres help the interpretive work and so on. But at that time you had to rely on the Party Chiefs to do the interpretation, at least the preliminary interpretation. I don't think any company would drill on a contractors map but they would check it or spot check it or work it themselves and then they made a decision to drill or not to drill.

#154 JW: With you having I guess, the ultimate responsibility for some of these inexperienced crews, did that cause you any headaches or. . .?

PB: That's very true. Not only myself but any supervisor had to do a lot more work. Every supervisor, at that time, we were hoping to get one supervisor for two or three, the very maximum of three crews. And among other responsibilities he had, he also had to check the interpretation and in fact, we requested them to carry one key horizon, at that time, the top of the Devonian independently of the Party Chiefs just to be sure that we were doing an acceptable job at least. That added more responsibility to the supervisors. That was in addition to their other responsibilities, field operations, field techniques, personnel problems and so on. So he had to be a well qualified geophysicist. Now that we had, the industry had, so did Century.

#168 JW: We talked in general last time about the location of geophysical operations in Canada and you had mentioned the north, Peace river and that area as a frontier, at least at that time. More specifically I wonder if you can talk about some of these areas that

Century was working in, I recall for example, for Amarada at Sturgeon Lake, and some of the problems encountered in that kind of environment found around Sturgeon Lake.

PB: As you know, the logistics of doing work in the north country, in the bush country, is still difficult. You've got to remember that at that time, when Century was working for Amarada. . . .at the same time I must mention that Century was not the only crew that was working for Amarada at Sturgeon Lake and other places. They had their own crew as well as, from time to time, they had other contractors do the job, maybe simultaneously with other contractors to evaluate the reservation because they did have a discovery there. Well, at that time, we didn't have any track equipment and we were forced to do the work in the winter's only. Summer work was almost impossible to do. We tried tractors, we put tracks on them, tried portable hand operated field work, but it all boiled down to the drill. You got to have a deeper hole and there was no way you could drill those holes to your satisfaction, deep enough and goo enough. Now we used augers, one type of ??? augers made in Illinois or someplace, we used them. Some people used the so called polter??? method which was put the dynamite above the ground on sticks about 2-5 feet above the ground and then exploded them. We had many other serious problems with that, multiples and so on. And in this Sturgeon Lake area, like many others, because of the urgency of our client's request, the job had to be done in the summer months. So the most reliable mode of transportation was using horses and unfortunately we had lost a lot of horses in the muskeg area because they would just sink in and there was no way could pull them out of there. But the job went on, today we wouldn't think about doing that. There were portable tent camps, personnel were unhappy, it rains a lot, gets muddy there plus muskeg. It was very, very difficult to do the job. Naturally the production, that is coverage per day was very limited by necessity because of the logistics. So we have come a long ways since those days, now we have track equipment and portable camps, comfortable camps and so on. But the early days we didn't.

#212 JW: Did you hire people experienced with pack horses and that sort of thing or did you just expect your Crew Chief . . . ?

PB: We always, at least in my company, and my idea was, try to hire local people, the farm boys. . . .as helpers mind you. Some of them have become technical people, believe it or not. There was one, we picked up in Barrhead and he is with a contract company now, Vice-President position. He may not know anything about interpretation but today a contractor doesn't need to do any interpretation. Anyway, so we were hiring, preferably, the farm boys. Of course, they knew about horses. We didn't specifically go out and hire outfitter type people or anything like that. But we kept in mind that you've got to hire somebody that knows the country, so the farm boys, ranch boys, or those who had worked in those places were better suited for the job and much more successful and much more reliable. And they had the ability of haywiring things and getting things going, at least temporarily until you could get a mechanic and parts and what have you. Now the city boys didn't know that, they couldn't do it. They needed a part and all they had to do was just order a part to replace it. But the farm boy he got in there and haywired it and got the thing going for a day or two until you got the part.

#237 JW: Other than logistical problems with respect to muskeg, I wonder if you could talk  
a

little bit about the seismic techniques employed in that kind of an environment, specifically at that time at least, how you got your coverage and shot hole arrangement or your spreads, just generally talk about shooting in this kind of a bad shooting environment.

PB: Okay now, the technique used in the muskeg shooting wasn't really very much different than in the plains area, in dry country. Basically it was the same, only you did have the muskeg problem, record quality and so on, you had to improve it. In the early days, we used quarter of a mile split spreads so the coverage was relatively lesser than it is today. Now we lay spreads of a mile, two, four, five even, they do it. There are advantages and disadvantages of doing that. But nevertheless, maybe 1/3 of a mile was perhaps maximum, that is one side of the hole you split and the other side again, 1/3 of a mile. Then in order to get records in muskeg area, we had to shoot what they call multiple holes, three hole patterns, four, six, we usually went three, five, nine and so on. And also we started using multiple geophones for the same channel or trace, whereas before it was one big geophone on one trace, one channel. But those improvements were also used or developed in a fair working countries, like the plains area in Canada and most parts of the United States and other countries. So the technique wasn't really much different. You had a problem to solve then you looked for a different kind of medicine. You needed more holes, multiple holes, instead of one hole, you had to shoot three or six holes simultaneously and we used more geophones and so on. Which was used other places as well. So I can't say as far as the technical application in obtaining record was much different than any other place.

#279 JW: Would it be correct then to say though, that muskeg is what would be called a bad shooting area?

PB: Ordinarily it is, because it hinders the propagation of energy going downwards and coming back up to the geophone. Traveling through that mushy zone, you lose the strength of your energy, to put it very simply. In some cases we tried to drill below it. At least we got rid of the downward going path, the influence of the weathering or the muskeg area but we still had it on the way up. But that of course, minimized the problem. . .it was still there but with multiple holes and multiple geophones, we canceled out some of those things. And in some places we got beautiful records in the muskeg, in some others we didn't.

#296 JW: What other areas that you worked in would be classified as difficult or bad shooting areas?

PB: From the drilling viewpoint, east of Drumheller, Hanna, there was a big pile of rocks there. . . I can't think of the name of the town there. And many other places like that where old river channels had deposited the big boulders and mostly glacial drifts created a lot of problems because we had to drill through them. A) it was difficult to drill, mind

you in those days, we didn't have vibrasize??? so you had to drill a hole and you had to get below that layer which meant two, three hundred feet at least. Not only the drilling was difficult but once you drilled the hole, when you put your charge in it, the hole would cave and here you spent all this money and time down to 300 feet, you can only load it at 40 feet or 60 feet. This happened quite often. Or the first shot, not having ???, we had to shoot and reshoot and reshoot the same hole. Okay as soon as you drill, immediately you pre-loaded it, in some cases this was not with the permission or understanding of the authorities but it's been done. Then you get the dynamite down at the bottom. The first shot, okay, but as soon as you shoot it, it caves in. The next shot you can only get down to 20 feet, 30 feet. That's from the drilling viewpoint. Of course, drilling conditions is related really to record quality. So if you had that drilling problem, chances are you didn't get good records, you would try to do something else. We still have those problems today. In Saskatchewan, in Qu'Appelle Valley, the drilling cost was more than the seismic crews cost in one area and we decided to use vibrasize???. That helped from another viewpoint, it satisfied the environmentalists because they were claiming that we were polluting the water table, which we didn't think so but the did, so by using vibrasize, you drill 15-20 foot holes, which is way above the water level and near surface velocity control, so it does the job and in the long run it's cheaper.

End of tape.

Tape 3 Side 2

PB: [ in mid sentence]. . . the foothills, primarily logistics, getting up there and also again, the environmentalists, and in this case, rightly so because we were really affecting the natural drainage pattern. And so they asked us to reconstruct the land like it was. I've got a picture of the entrance, I'll show you where we worked, it's very difficult, but it's logistically difficult. And seismic results viewpoint is difficult too because you are dealing with very steeping beds, high dip, which in many cases the thing is almost vertical so your energy just keeps on going, there's nothing to reflect it back. And we had unconformity problems there as well. But these are not peculiar to Canada, these are problems you encounter in many other places, in the foothills, in the mountains and so on. You do the best you can to get as good results as you can.

#015 JW: One of the other areas you mentioned the other day was in the Swan Hills and you had an interesting little recollection of Hans Suter???

PB: Yes, I think that is quite interesting as far as I'm concerned. There was a company called Regent Refining, Trinidad Leaseholds. And the well known Dr. Suter was in charge of that company here. He had four township reservations there, which today is the Swan Hills field, that area there. And being a smaller company they didn't want to spend too much money but they had to spend some money and also try to evaluate the reservation. Dr. Suter hired our services for one winter only, which really was nothing more than maybe 8-10 weeks. Now to that point no oil people or geophysical crews had ever shot in

that area, had ever been in that area. We were told that the area was infested with all kinds of bears. And Dr. Suter didn't want us to spend too much money and he didn't approve of having the expenses involved in bringing in a wheel trailer camp and in his inimitable fashion he says, what the heck, there's all that timber there and make log cabins. Get somebody to help build you those log cabin. Well to make a long story short we ended up by doing that and we had a miserable crew because it was too cold. But nevertheless we did shoot the area. We were, like I said, the first ones to go in there and the crew experienced a great deal of difficulty with the bears, especially in the camp dump area and they were mostly grizzlies. So the boys being boys, they put a stick of dynamite there and a plunger in the camp, watch the grizzlies come in. When they came into the dump, they pushed the plunger in and killed one or two bears, at least that's what they told us, the number they gave us. Then we got a big blast from the Alberta government that our boys were killing a very special Swan Hills grizzly bear, they had a technical Latin name for it, I forget what it was. So they gave us a warning, be careful and don't you ever do that again. That was interesting. Anyway, with the little shooting we did, and I was supervising the crew, we worked the records, the old fashioned paper records. It appeared to me that there was some kind of a reef there. I mentioned that to Dr. Suter and of course, he got interested. He had a commitment to drill, I guess it was two holes there, or they wanted to drill two holes. Well, they didn't have the money but I felt, from my work. . . , mind you this is a virgin area now. . . that there was reefing there of some sort, at Devonian level but not quite like the Leduc reef type reef. Anyhow, Dr. Suter said to me, well you know a lot of people in the States, why don't you see if you can get them to drill a hole or two and I'll give them 50% interest or whatever. Well, sure enough I did know some people that would have been interested but because of our upbringing, training in ethics, I felt that would be unethical as a contractor working for the company to peddle his acreage, to use simple words. So I told him I was sorry, I could do it but I would prefer not to because of the ethics involved, you're not in that kind of business and I shouldn't do it. Well eventually then, Home Oil got in there and they developed the field. After the field was known to exist there, it hadn't been developed yet, I asked Dr. Suter, I said, I'm quite curious, how on earth did you decide to ask and get this reservation for your company. Again, in his own peculiar way he said, oh, Pete, he said, he pointed the map to me, where it was showing the oil and gas deposits and he went northwest of Swan Hills and showed me, you see, oil and gas here all the way and then further south, you see all this, so it's not going to stop there, so I thought there was something in there. Well, that's good logic and he was successful. That's the sixth sense of an explorationist, I guess. And not like bragging, but the thing that pleased me very much or flattered me was that after it has been discovered, the word got around that I had predicted some kind of a reef there and very unusually, at that time, BA Oil, which is Gulf now, their Vice-President, Exploration Manager, Chief Geologist and Chief Geophysicist asked me to join them for lunch which was rather unusual. We were friends and all that but they didn't buy my lunch, I used to buy their lunch. So we sat down for lunch and they brought the question us, we understand you were successful in predicting the Swan Hills, what did you do, what do you see, we can't see anything. So I told them

in general terms what was involved. This gives you a personal satisfaction.

#087 JW: In addition to the personal satisfaction did you reap any direct rewards as that turned out to be such a major field, there was nothing filtered down in that way?

PB: In their eyes and in my own belief, I was on the job I was supposed to do and my company got paid for it and my company paid my salary, that was it. Your only thing is your recognition in the industry and the ability to get more jobs for the company you work for.

JW: Would it be interesting to ask what kind of equipment was used in the Swan Hills project?

PB: I think Jim, at that time, we had the very early tape called Magnadisc???, it was analogue tape recording. Magnadisc was like old fashioned phonograph records and it recorded the data on that, that's why they called it disc and a magnetic type disc. I'm pretty sure that's what it was, that was the early application of tape recording, only analogue mode rather than digital like we're using now. That was a phase we went through. From no tape to analogue tape and then the digital tape. And of course, we were able to process the analogue tapes. In fact, Century, not many people know this, was the first one, I might add with my initiative and with the support I had from my Tulsa office, to establish the very first data centre in Calgary that was an analogue system. And again it was TI, Texas Instruments, they called it Seismac???. Being something new, we had tremendous amount of difficulties, circuitry. . . , we didn't have the fancy electronic circuits and things like we do now. We had tubes, the tubes would burn out, we didn't have transistors of course. And the printed???, circuits were not . . . , in their very early stages, they were not too dependable and there were not to many of them. So we were open to problems all the time. A tube burns out, like an old-fashioned radio sets, glass tubes, well then you have to trace it down to find out which tube it is. You check every one of them and so on. Of course, you narrow it down, with the bad results you get you know it's in this section but which one and we had jillions of them. And that computer room was so hot, even though we were air-conditioning it because of those tubes. It was all right in the winter but in the summer it was unbearable, even with air-conditioning. And there again, afterwards, SIE came in with a better smaller unit and so on and Seismac lost it's status and we were left behind. And then we started another digital system but that was much later.

#127 JW: Just for the record, what was the year, do you recall that your crews were in the Swan Hills working for Trinidad Leaseholds?

PB: Of course, that was before the first hole was drilled. If I want to guess, I want to say, mid 50's, maybe '57, '58. I'm guessing. Time has gone by.

JW: Just out of curiosity, when you had lunch with the people at BA, were they looking at the same data and information that you had?

PB: I believe they had acreage nearby there and also anything new and different like that, explorationists look in other areas, where can we find similar conditions or similar lithology???, therefore they would have been interested and they were interested naturally.

#140 JW: That turned out, the Swan Hills and your work there to be quite successful. Did you ever have to justify a dry hole to management or. . .?

PB: Not in terms of the word justifying. Mind you no oil company is going to drill on one man's word or a contractor's word, I should have reversed the order on that. So we are now living with most oil companies, a committee decision. You can say everything looks good and we think there is a potential here, that's about all we can say and then they took it from there and they make the decision. Oil companies are used to drilling dry holes, some of them look at it like, it's not a total loss, we got geological information, which in many cases dry holes have led into discoveries. It happens quite often. If you've done the work right, nobody would criticize you because they were partners, in fact they were the ones that made the decision. You might have pushed it a little but again, they bought it. The only place you had to justify your position was when my crews surveyed another area than what we were actually on and we did some shooting there and we got caught, rightly so, they gave us heck. That was inefficiency on our part. In cases like that yes. In some cases not as severe criticism, but some of the oil companies had their own ideas. I know one case, I prefer not to mention the company's name, one of the biggest ones in the world. Their supervisor went in there and told our men to use this and this and this shooting technique. A week after that, I go supervise the crew, I see the results, I don't like the results and I said, let's try this and this and quality improved 100% or more. Then I took it upon myself to tell the Party Chief, you do it like I said and no sooner than I get back to Calgary, I get a call telling me, what do you think you are changing our plans and so on. So I said, just a minute, I'll come over there and talk about this thing. So I did. And that was a Chief Geophysicist, so I explained to him and I showed him the differences because I was prepared for it. And even though he agreed with me, he said, it's the principal of the thing. You are a contractor, you do as we tell you. I said, I'm a contractor to do a good job for you. But things like that do happen. Another similar situation, again with Century, I'm supervising these two crews, one crew is working for a big major oil company, let's call it company A. And we started shooting them and so on. Well this company A were very specific in their requirements, you knew what they wanted, therefore you priced your services accordingly. And then there was company B, we had a crew working for them, but they are the very demanding type. They want you to do a lot more than company A and that price was according to their requirements, a little higher. It just so happened this company A and B made a deal to work the same area and company B put that crew into where our company A was. Naturally they shared the expenses so they got to see our invoices and I get a call, what the heck is going on here, come over here, we want to talk to you. All right, so I go there and they says, how come they're 20% cheaper than we are, I says very simple, Joe or whatever his name was. He says what do you mean very simple. I said you demand one hell of a lot more than the other company and you are priced accordingly. And he stopped, he was speechless, he looked at me, they don't want all those things, I said no, he said, okay, I'll buy that, that's okay. The guy was ready to kill me. But then he was fair enough, he understood the problem.

#208 JW: You had another interesting situation with Sinclair Oil at Claresholm and that's an interesting story too.

PB: Just south of Claresholm, 4-7 miles south, Sinclair had farmers land. We did the seismic work, we saw a little ???, a little structure. They went ahead and drilled it. Now at that time, down in that general area, southern, central Alberta, there was no discoveries to speak of, a few maybe here and there. So this was a big thing because they discovered oil, I forget now but somewhere around 5 or 600 barrels a day and everybody was very happy. And they immediately, the adjoining farm where the geophysical work showed that the structure extended that way, he had the mineral rights. Very few do in this country but he did. So they gave this man, just under half a million dollars, \$350 - \$450, somewhere around there. And the human story about this, as soon as the guy got the money, he took the money, he disappeared, he left his family, nobody knew where he went. That's in parentheses, what oil can do sometimes. Anyway, so this well was producing real well and they asked me to go down to the well with their General Manager here, which was Walter Wilson and their Exploration Manager and so on. They were going to take some pictures that were going to be put in the Annual Report of Sinclair Oil Company, the parent company, on the front page. Because of their kindness and goodness, they asked me to be there since I was involved in the work. So we went down there and they brought a photographer from New York City of all places. Of course, their headquarters were in New York. I mean as if we didn't have photographers here. But he was supposedly a super-duper photographer. Anyway he took a bunch of pictures and so on. So he went home and we came home and three months later, the well started making water, it was dry. In the meantime they were drilling an offset, that was dry. So needless to say, our picture never did appear on the Annual Report.

#252 JW: I guess one other kind of a problem area might have been the Keg River reefs up in

the far northwest. Were you involved in working with those at all?

PB: In the Peace River country?

JW: Well, even further, the Keg River reefs.

PB: Yes, I was involved but not as closely because by that time I got a bigger job, I was head man of the company here. I wasn't directly supervising, my supervisors were reporting to me. About that time I spent two years in Tulsa so that removed me a little more than that. I know, I remember, I was exposed to the problems involved there. I'm talking about pinnacle reef type thing and after they discovered it, the area got so hot, that apparently there were so many crews shooting so close together because of the nature of the structures, the pinnacle reefs, you had to have real close control, maybe half a mile, quarter of a mile. And people were waiting for each other to shoot so they move on, so we go on there as if there was a traffic light there. And many people had been recording other people's shooting inadvertently, they happened to be shooting the same time. So they did have, from a logistics operation viewpoint, they did have these problems. This area is the Rainbow Lake area, and then ??? Lake is to the north which is to follow up on that same type of work there. Quite interesting and I think it gave an impetus to the oil industry

because we had periods of stagnation, no discoveries and then bang something would happen. Pembina, the old Pembina, the stratigraphic trap was one of them in the 50's, Leduc and ??? Lakes were all discovered and there was nothing for awhile. People were getting a little nervous and then bang, something would happen. Pembina stratigraphic trap is one of them. Rainbow Lake and ??? Lake is another one of those things. Swan Lake to a degree it was the same way. And later on the pinnacle type in West Pembina created a lot of excitement. So we had these ups and downs, stagnation and then activity.

#298 JW: One of the other things you mentioned was the relationship of seismic crews and field operations with land owners and entrance fee payments and how that changed over the years.

PB: Well, it's been my experience that over all in Alberta, and British Columbia and also Saskatchewan but particularly in the farther north areas where there was some agricultural activity, the farmers were extremely nice, helpful and accommodating to our seismic boys. They'll ask them for lunch, dinner, they would give them coffee, tea, even beer sometimes. The relationship was tremendous. Now, you know, it's not so. Unfortunately that's due to, it only takes one bad apple in a crate and that's what happened, some people just didn't give a darn, they didn't respect their property, their rights and they caused the problems and so on. And when they got reimbursed for their damages, this opened the way for false damages as well. Oil companies, they'll give us the money. We had to give little or no trespassing fee even in the plains areas. But that changed, now you got some areas where they charge you \$3-4,000 a mile to get across their land. Which becomes prohibitive for smaller companies to do seismic work. I think the problem there was. . . , the relationship was excellent. . . , as an industry there were some mishaps that shouldn't have happened but they did. Some couldn't have been helped, some perhaps could have been helped. Also the oil companies started. . . for some reason, they were outbidding each other to give more money to the farmers for trespassing. One company would pay \$100 a mile, the other company would come and give them \$150, whether they knew it or not I don't know. But if you give them \$150, the next one, they ask for \$200 and this went up and up and they go to the beer parlor, they exchange the information. So that caused a little problem too. And they formed these association, especially south of here, they have a common front, that's it, you take it or leave it.

End of tape.

Tape 4 Side 1

JW: Okay, so they were starting to get together and sharing this information and asking more and more then?

PB: Oh yes, they have associations in the southern part of Alberta and this is spreading around. Mind you the oil companies, in all fairness, they were very cooperative in compensating the problems. Sometimes they were even too generous but they didn't want any bad public relations. And oil companies, since I've been in the business, have always

been very conscious of public relations and respect for environmental conditions. I can say that without hesitation. But there again, the more generous they are, the more demands. Many places the boys left the gate open or they cut the fence and the bulls and the cows got out and so on. Well in every one of those cases, the bull was the one that cost \$1,000,000, very unique, the best one in the world. Well they couldn't prove it and that can't be proven it wasn't.

#016 JW: I guess in about the 1960's you mention, there was a takeover fever that occurred and Century Geophysical got in on that a little bit, I wonder if you could talk about. . .

PB: Well, that was mostly in the United States, however it did find it's way up here too, to a lesser degree. Every company wanted to diversify. I think Jim, you'll find this periodically so. Right now, we're in that phase too, or we were in the last couple of years, every company trying to buy another company. As far as Century is concerned, they bought several small electronic companies, one little company building small motors, for instance. And up here, we bought Smalley's??? Radio they called it, it was a wholesale electronic parts company. I was instrumental in that, for two reasons, one was our field personnel were getting older and older and this seismic field work requires young people and we got to a point where these people had contributed so much, but now, what can you do with them. There was no place to put them, at least the key personnel. So I thought this would give them a chance to work, they were exposed to electronics, they could talk the language so I used some of our good old faithful people that were too old to work in the field anymore into that place. I had that object. Number two, it's mostly administrative reason, like many other American companies, all our profits and other funds in the form of management fees and so on, which really, they didn't do too much management for us, we were semi-autonomous here. I wanted another entity that should business be slow and so on, we had that to compensate for the difficult days because in the difficult days, with the type of people you had on the Board, of any Board for that matter, you don't make money, out you go. So this would stabilize the efforts until the business picked up again. So for that reason I pushed that and we diversified into that. Another problem we had, we still had the seasonal variation of activity. One way I tried to overcome that, after making some inquiries and studies, at that time, orders have been found and the time has come to be building pipelines and there were a lot of pipelines being built. Mind you this is the late 50's, early 60's and I found out that there is such a thing as radiographic inspection of the pipeline welds. I looked into it and it kind of suited our boys, it was field work, there was a truck, instruments, equipment. They just wrapped around the film and took the picture and so on. At that time pipelines, 90% of them were built in the summer when the geophysical work was done, so I could use these people there in the summer and then they were there, use them in the winter on the seismic work and it worked beautifully and we made money on it. Not a hell of a lot but we did make some money on it. At least it helped minimize our losses.

#059 JW: Plus you kept the people on which is good.

PB: Right. And this went on for many, many years. I understand that they got out of it now.

But one of the boys that I put in charge there left them and he started his own and he developed a nice little company and sold it to a big American company and he had been with them, I think he retired now. So that was a potential which was proven and so on.

JW: What did you call yourself in that pipeline inspection aspect?

PB: Century Radiographic Inspection. It was not a separate company, it was just an internal division. The only thing you had to be very careful, other than giving good service, was you were dealing with radioactive material so you had to be very careful that you didn't cause any health problems with the boys. But the government see to it, the monitor films and so on and they are examined by the atomic energy commission in Edmonton, a branch of it there. So we didn't have any problem, except one time they lost . . . , the radioactive cylinder was stolen, and with the help of the RCMP they found it. Young kids, they didn't know what they were doing so they got it back.

#074 JW: You raised an interesting point a minute ago with respect to the field crew personnel who are exclusively field crew personnel. What did they do, I mean you were able to help some but what does a guy do when he gets to be forty?

PB: That's very unfortunate. That problem exists today, now some of them you can bring them in when they reach that point where they cannot work in the field, even though they might want to, they are not efficient enough, you can bring them in, put them in your shop if they were mechanically inclined. Fixing trucks, washing them and so on. You can put them in the shipping and receiving department. You can use them as messenger boys and so on. And if they were seismic operators, then they can work in the data centre, it's a matter of pushing electronic machinery buttons and they can do that in a shift or two. So that's about all you can do. The others that don't have qualifications to do those kinds of jobs, it's rough, really. And they let them go. By economic necessity, we laid off helpers, unskilled personnel, you had to. But I always tried to hold on to the assistant category and up. Because without them you couldn't do the service. The ones that didn't do that, they suffered because of the quality of the work. On the long run it paid off but this was very difficult to convince your Board of Directors sitting in Tulsa, Oklahoma without knowing what the score was up here. But if you're successful, you could tell them, that's the way it is, you just wait, you judge the performance of the Canadian division on the yearly basis, at year end only. You can't judge it . . . on the first quarter, you did very well because it's winter months, second quarter so-so and in the third quarter, summer quarter, lousy, you dropped \$400,000, forget it, we'll pick it up in the next quarter where we have picked it up before. But as long as your year end was profitable then you don't have any problems.

#102 JW: You mentioned to pick up the slack in the summer, you got involved to some degree in that electronics parts and then more significantly in pipeline inspection, weld inspection. What did other companies do, geophysical companies do in the summer?

PB: Well some of them get into other not associated businesses. Some of them, I understand, they get into actual interest in oil, investing in plays and so on. And others, especially the multi-national ones, they expand their activity in the same area, that is more computers, more this and that if they can sell it, they try to expand their operation. But it's a very

difficult thing to do in this country because of the seasonal variations. I mean, Century or any other company could have put out, there were years you could have put out 25 crews, in the winter months only. But if you consider the investment you have on a crew, on the instrumentation and you realize how scarce the personnel are, you wouldn't do it and you didn't do it and we didn't do it. My formula was to double, maybe double plus the number of crews you had in the summer months, say from April to October. If you had three crews, then you could go up to six in the winter, maybe seven. Your supervisors, instead of supervising one or two crews, they'll supervise three, it's still adequate. And instead of hiring in the summer, unskilled labourers, you use your assistants and then in the winter you use your assistants either in the key position or the assistant category. You could expand there. This was the formula I used and I understand a lot of people agree with that. The point I was trying to make, without the ??? economics and performance any contractor, many years could have put out 20-25 crews in the winter. And those years, the winter not being in the far, far north was really 2 ½ months, maybe 3 months, maybe 3 ½ at the very most. Comes March 22<sup>nd</sup>, you better get out of Peace River country. If you don't you can trap your boys, they're unhappy and they're seasoned with the idea that we're going to get out on the 22<sup>nd</sup> because that's break up time. You try to keep them in there even though you have cold weather. They won't stay because they already made money. These are young people, little or no responsibility. Responsibility in the sense of family and so on, very few married, most single.

#140 JW: Talk for a few months about the transition to computer applications in seismic business and just start off generally with what you perceive what the impact might have been with the introduction of computers.

PB: Explain what you mean, I'm not sure I understand.

JW: When computer applications came into the geophysical business was this a tremendous change, were you able to do a lot more interpret things more clearly than you ever were in the past?

PB: Oh definitely so. I can freely and without hesitation use the word, revolutionary and it was. But one thing, computer application is related to digital tape recording, so you had the basic data on the tape. If nothing at all, you could do a lot of things with that tape, you could play it back any way you wanted and try different things. All the paper records, you shot, you got the record, that's it. You couldn't do anything else with it, that paper is it. You can make a copy of the paper but it's the same thing. That enabled the interpreter and computer personnel as well to apply various parameters, various approaches to enhance the data and if the data didn't appear reasonable, then you could always use that basic data again and then do something else in an effort to confirm positively or negatively. Is there something wrong or that's the way it is, sort of thing. And the greatest advantage, in my opinion, is that in the record sections, you're really getting a geological cross-section with a seismic elements in it. That is reflections. This makes the interpretations much easier and the presentation of the section to higher ups, who don't have time to analyze it and you can prove to them and you can show them, look here it is, it's coming up, here's the reef or here's the fault. Related to this, and this is one of the biggest advantages in my

opinion, is that in the past, geophysicists were in one corner, they didn't like the geologist, the geologists were in the other corner, they didn't care for the geophysicists, they thought they had a magic box and this and that. To a degree they were right because the technical limitations of seismic wasn't like it is today. Now these record sections are understood by the geologists, so it has brought the geologist and geophysicists together, even to the extent that today's young geologist is at least half a geophysicist, or at least he can interpret, understand the record sections. Likewise today geophysicist understands the geological problem. He's exposed to geology and these record section did that. It brought them together, which is the way it should be, it should have been years ago. But all the information together, because even with all the advanced technology today, we are still dealing with many, many unknowns, very few knowns. So this is where the experience, skill, sixth sense, imagination come into the picture. When you look at the record section that stimulates your imagination, your ideas. And it ties it to the geology as well. That in my opinion has been the greatest value of the displays of record sections.

#198 JW: How did the companies, your company for example and others, adapt to this new technology because you had been and your contemporaries a generation without this kind of technology?

PB: Now that's a good question. Before I answer that I want to come back to what I said, I want to add something to it. I said the geologists understanding record sections, but there are still some problems, that the geologists take it as is whereas the geophysicists know that that is not reliable information on the section. So there again the two must get together. Also the geologist must understand certain limitations on these record sections, he can't just ignore everything and say that's the way it is. He has to check with the geophysicist. Now back to your question. The changeover was transitional. It wasn't all of a sudden one day, you go from paper records to record section displays. In the interim like I said a little while ago, we had the analogue sections and so on. But nevertheless I can see the merit of your question very well. The older geophysicists, including myself, we did not have this technology in our schooling. The work we did in our early professional days did not involve these things. For a human being the most difficult things is to adapt to new ideas, there is always a resistance to it. There was, or there might have been some resistance in the early days, but when you have a good product everybody accepts it. So resistance against the section does not exist now, I don't want to be misunderstood. The limitation understanding of the computer technology is lacking in older people. Now a lot of them made a very serious effort to learn but when you get older you don't learn as fast and as good. But in the meantime, the new generation coming out of school, they were exposed to these things and new ideas and so on. In cooperation with the older fellows, I think that worked out gradually to the benefit of all. That is, the older geophysicist, even though he didn't understand thoroughly the procedures that you follow to attain the sections, he respected what had been done but he could still and perhaps better than the younger fellow can interpret that section. So it hasn't created a big problem, other than to say, those people couldn't have gone into a computer centre and do the computer work as well as the new generation that has been

trained for it. I really don't see any serious danger industry wise. Personally for certain people, they couldn't cut it, they couldn't understand it so they got left behind. And like I said the change was gradual. They learned, a lot of them did learn. And we're coming to a point now where some of those so called younger geophysicists are getting into responsible positions, replacing the older generation.

#258 JW: I think we talked before about the change in the industry where the people now doing the interpretation are not really the people in the field gathering the data and I was wondering, as the final interpretation of seismic data is done by the people today that have little or no contact with the field, do you think this has made any difference with what might be called a lack of feel for the data?

PB: I definitely believe so. Mind you I belong to the old school. If a fellow is out there in the field, knows the existing conditions and if he sees something funny on the records, he can try to correlate the funny event on the record section with what was happening in the field. Some of those things with computer technology are corrected, taken out and so on, but some still creep in. A very crude example would be, suppose you're shooting an area where the farmer has got a tall wall, say about a mile or half a mile from where you are shooting. Well, the energy on the surface, not all of it goes down, a relatively small portion of the energy goes down, the rest of it is up in the air, it can go to that wall and reflect back from that creating a problem. Now this is relatively easy to find and to understand but then if that is shown, if that is not corrected in the record section, the effects of that is appearing which has nothing to do with geology, it's a man made walls reaction to your energy. Well if you're in the field, you know that wall was there, you immediately say, hell, I'm getting that from that wall. Or you're in a canyon, the same thing can happen. Now if you're sitting in the office, you assume that shot was in a flat area whereas it's in a canyon. You start throwing your hands up in the air and say what the hell is this. So it would definitely be a great advantage for geophysicists, interpreters to be in the field or make frequent periodic trips and see what the conditions are. That would help his interpretation very much. And unfortunately now with computer technology and again for personnel, they're not liking to spend time in the bush, a lot of people in the industry don't know anything about the field operations. We got to a point too, where we standardize a little too much too, I'm afraid. We don't spend enough time to do a little experimental work in the beginning of the project to see what the problems are and what parameters are used to acquire better data. We say, we're going to shoot three mile spreads and 110 foot separation, this and that. Well, it might be you could do a little better otherwise. A little experimentation could help that. Now that's now being done. Part of that is economics because it costs money to do the experimental work. Mind you some companies do some experimental work, especially in problem areas, but I like to see it done a little more often.

End of tape.

Tape 4 Side 2

JW: One more quick question, sort of in a similar vein, with respect to computers, do the interpreters today, do you think, understand the processes that are going on inside the computer, what the computer is actually doing?

PB: They have to understand the basic principal, even more than basic principals to make a basic interpretation. Because you could have events shown on your record section that have no geological meaning, extraneous noise or instrument problems or what have you, number one. If they understand, have a fairly good knowledge of computer technology, they can pick those up right now. Number two and perhaps more important, they can, in the early stages of the processing, again by experimenting, by discussing with people and so on, improve the processing method for the objective you have in mind. It is difficult to solve all the problems at all levels in a geological section on a record section. You more or less concentrate on one, if you're looking for Cretaceous sands for instance, then you concentrate in there, perhaps at times at the expense of something else, but nevertheless that's your objective so you have to do that. So if he knows the computer technology he is a position to tell the computer people, whether in-house or a contractor, I'm not happy with this, I think we can improve this and that. If he didn't know anything about it he will accept it as it comes. That would be dangerous from that viewpoint and it will facilitate and improve his interpretation by so doing. Sometimes these computer centres, especially the commercial one, they do what we call extreme cosmetics, everything looks beautiful, you can't do it. They've got means of beautifying those records, it's like an ugly woman with a lot of make-up, she looks a little better. But when they do that, we're losing something. I have a little trouble getting this idea to younger geophysicists because they too are inclined to see beautiful reflections but is it truly that way in the ground, does it reflect the geologic conditions. If you did unconformity surfaces for instance, or you might expect sand development on the flank of the unconformity work, gas and oil might accumulate. Do you want to have this cosmetics to show your nice and smooth reflection path. I'd rather have it a little less good looking but meaningful. But these things are important for an interpreter to assess and to do that he's got to know the principals of computer technology. Not necessarily being able to go and do the job himself, the processing himself, but understand how and why it's done and how it's done.

#039 JW: Throughout the history of seismic, what have the innovations come from and have there been real innovators?

PB: Well, just like in other innovations, there is the need, number one, to improve and a free enterprise, competitive attitude, you want to do better than your competitor and you work on it, you have good people, you have a research lab and so on. Even though these are two things, but also you have to have improvements in other areas. For instance, not only in seismic work but in electronics, the improvements created by NASA for space investigations. They had to have smaller, more efficient, more reliable and so on. This finds it's way to other areas, smaller radios and better seismic instrumentation. So in addition to what I said about innovation, the needs, requirements and competitiveness, you also have to depend on other improvements in physics, chemistry, electronics,

electrical engineering and so on. And this is what we're enjoying now really.

#057 JW: Are there people that you can look back on and say. . . , we've talked about Hyland, we've talked about some others last time, that were the real prime movers in the industry?

PB: They were, Hyland came up with a set of instruments. They were acceptable instruments, they were good instruments for that time. And in the early days in the States we were dealing with mostly salt domes and refraction was used quite a bit, it's still used and it can be used for many reasons. Then reflection seismography developed. It's just like. . . , take the automobiles, you started with Model T and you have today car, there's no comparison between the two of them. You had to start someplace and step by step get to where you are now and this is exactly what happened in the seismic industry. We did have people, you mentioned Dr. Hyland, he was knowledgeable but he had the advantage of being in a place where seismic was accepted but we didn't have many seismologist or seismic people. But he had that education in Germany and he was a good salesman. He came to this country, the United States, as a salesman anyway and he promoted it. Then he formed his own company, made instruments and so on. Dr. Hyland's instruments, he had some kind of, what is called now, automatic gain control, compander??? I think he called it at that time. That was a darn good idea, it controlled the volume, like on a radio. When it gets too high you have some gadget that keeps it even, well that's what this was doing. Because the first burst of energy is real strong so it compressed that, companded that. And then later on, you want to open it up because they are weaker signals coming in. That was quite an innovation and his instruments were very acceptable for that time. We are talking about mid-thirties, Hyland's instruments, then you know, he does that and somebody says, my gosh, I can expand on that compander, I can make it an automatic gain control by adding this and that. And then the other guy improves it more, growing with competition. So you can look at it as a natural growth and as long as there was demand in our type of economic society. You have a better mousetrap, well somebody will buy it.

#093 JW: You touched on this a few minutes ago bu I wonder, just pursue it a little bit more. In your experience what do you perceive is the difference between and oil finder and a technologist?

PB: Well, it's a good question and it's a very general question. First of all let me say this, when you say an oil finder, I don't look it as one single individual, he has to have the help of many others, in many other disciplines even. So no one oilman has found Leduc, even though on the street, some of them are ??? I met more people that discovered Leduc, which in a way convinces me more so that it isn't one man's job, it's a cooperative thing. From the man who wrote the cheque to get the reservation, he claimed that he discovered the field, the landman, the geologist, the geophysicist, the drilling man and so on and so forth. So the oil finder is not a single person, he is associated with others. Among them the technologist. While you are drilling you use the technologists, primarily because they are willing to work in the field and they are happy having that job and they have had a good education from SAIT here. I was involved in their courses, I was very, very pleased

with what they were doing and the product they put out. Technologists in seismic work, they become good operators, good party managers and so on. So you see, all these people help the so-called oil finder. Now sometimes one guy gets the credit for awhile but you look into it, you'll find it's a group of people, various efforts in various stages. And the interesting part of it is the more aggressive ones, the more interested ones in your group help you to find oil faster and perhaps with a higher degree of success. So they have their place. . . , like I said, I don't look at one man as being the oil finder.

#126 JW: So you wouldn't say then a fellow like, as we talked about, Hans Suter who looked at the map and saw this area and . . . .

PB: Let's go back to Dr. Suter. If he didn't have that vision, wrong or right at that time, to get that acreage, well he deserves credit. But the seismologist, the geologists, the drilling and so on, they all contributed to the discovery. You never heard me say I found this field and I found that field. I said with the help of others, with their assistance, we did this and we did that. But you'll find a lot of people say, well I found. . . . I don't believe it.

#136 JW: What do you see as the future of black boxes, what are they going to be like?

PB: There's no question in my mind, we are going to keep on improving. We are in the thresholds of beginning to distinguish stratigraphy in seismic records. That is to say, whether it's limestone, sandstone, shale or what have you. Gradually we're getting. . . we're not there yet. . . getting to direct indication of presence of hydro-carbons. Now in a limited sort of way, we do that, we have done it here. The so-called bright spot for instance, came into the picture 5-8 years ago. To strengthen the argument, I did some consulting work for a medium sized company. This particular area was in the central eastern part of Alberta, that is say between Calgary and Edmonton halfway, east, where you have manville??? gas. And you find, with the new technology, we have both field operations and processing, you see these bright spots. On the basis of bright spots, we selected eleven locations, they drilled all of them, nine of them were commercial gas discoveries, two of them hit coal, which manifests itself the same way with this type of a bright spot. Of course I told them, this is still hydro-carbon, they wouldn't buy that. But you see in a given area under given conditions, we have done this, we are doing this. You take that type of a bright spot and try to apply it in some place in Indonesia, you may or may not be successful. But we're gradually getting to a point where we understand that. The lithology??? and direct evidence of hydro-carbon accumulations, gas or oil. It think we'll improve more and more on that and we'll be much more positive. Now you talk to some young fellows, they're going to say, oh I can find all kinds of oil and gas with bright spots and I know doggone well you can also drill down into salt water, coal deposits, or something unrelated to oil that produces that bright spot. Or it may be instrumental, instruments haywire then you got this bright spot and there may be other reasons for it. But in a given area with your knowledge, with well control and with experience you gain, we have begun doing that. More so for gas than oil. Oil bright spots works in some places as well. But we're going to improve on those things. It's interesting to know, I might have

mentioned this in my early discussions. I started studying geophysics in 1937 and my first degree was in 1941 and at that time, Colorado School of Mines, they would not give you, even though we had a geophysical department, even though our course of study was different than geologists, even though we had a lot of geology, they would not give us a Geophysical Engineer Degree. They will call us geologists, you know why, because they weren't sure where geophysics was going to go. And you know, if it doesn't fly, why hinder this guys future. They have enough geologist then we'll call them Geological Engineers. If your employer wanted you to certify that you have taken geophysics they would gladly give you a paper to do that. And there were times in my early days, I would say, heck, we shot here, we shot there. . . at that time the concentration was in the Gulf Coast States, Texas, Mississippi, Louisiana area and that's where the oil business was. . . and you say, well, we're shooting all these things, what about five years from now, there isn't anything. But Jim some of those areas have been shot 5, 10, 15, 20 times and they will be shot again. Because of technology improvements in instrumentation in geophysics and also the geological information and new ideas about oil accumulation and depth, depth of drilling, economics. I hired a fellow by the name of George Sherman, he had just finished University of Alberta and he was living in Edmonton. He applied for a job, his application form, we sent him one, he sent it back looked very good so I wanted to hire this guy. In one of my trips up north I stopped in Edmonton and talked to George and his wife, at that time the family wasn't here then, newly graduated. I hired him, he worked for us and he ended up with Pacific Petroleum and so on, finally with Petro-Can, he took early retirement. I ran into him on the street about a month ago. He said, remember the time you came to my apartment and wanted me to join your company, and I said, yes I remember. I had forgotten, he said, I had asked you, what do you think about the future, how long will this go, so apparently I told him, I must have said, George, I guarantee you. . . he said that to me. . . at least 25 years. Now this is '50 or '51. So he was thanking me for having told him the truth. This shows or indicates two things. One, even I wasn't sure in '51, it would be more than 25 years and two, I guessed it right and the guy remembered. So it's here to stay, there's no substitute for it in the horizon. It's a relatively simple and cheap method. You look at the underground from the surface, how else can you do it. Now we might change our techniques and so on but the principal will be the same. And I think we'll improve in the areas that I told you. More stratigraphy and the type of rock we're dealing with and most likely the direct indication of hydro-carbon accumulations.

#236 JW: Speaking of the horizon, do you think the oil reserves are finite and if so, what next, what's the future in that respect?

PB: This is quite similar to what happened to geophysics. At first we don't think there is enough but year after year, we get new ideas, new places and the offshore possibilities especially, in deeper drilling areas. We've got all these oceans and really, relatively speaking, they are. . . , very little exploration and drilling has been done because there again, technology. Now up to about 8 years ago you couldn't drill more than about 4-600 feet of water offshore. Today we are going 2, 3, 4,000. We still have problems in

completing the well. It's economics. If the oil patch goes up, there is many, many horizons to open up, not only offshore, I think the most potential is there but also onshore, new ideas, new horizons, new approaches. I think for hundreds of years we'll have plenty of oil in this world here. During the oil crisis, a friend of mine, we were having lunch, we were talking about the shortage of oil, which we did have at that time, Bill Blair his name is, he's with West Coast Chief Geophysicists and we got in a big argument. He said there's going to be less and less oil, I said, Bill, we are going to have more and more oil and we'll have surplus oil, you wait and see, with time. And that's what happened. Today we have a surplus of oil, excess oil in the market available. And I think you will find the same thing but we put more effort. The Arabs hurt us but they also helped us. We smartened up and we started looking. As we mentioned before, 10 cents oil was very attractive to the oil companies in Saudi Arabia, but now they realize it isn't only money. Not only have the Arabs raised their prices, but even if they hadn't, they realize that they could stop the flow so we better get some in our own country, both in Canada and the United States. So he said, you're bleeding the reserve, yes, but I think it would be, I would guess a few hundred years before we even have that worry. But we've got to work and find more, we've got to improve our technology. Look at all these oceans, all the land. It's going to be more expensive to find it so we're going to look at a higher price which will induce further exploration in more difficult areas. I was involved in frontier areas, I still am, around Greenland and so on. On the basis of \$40, \$50 a barrel of oil, we had some prospects to work. But as soon as the oil price went down to \$29-\$30, those people, rightly so, said hold. We're not doing anything at this price, we're not going to lose any money and they're right. So we're on hold position now, but if the oil price goes up there are many places you can look for it. You won't find it everywhere but you'll find it in some places and with the technology we have now, whereas in the past, with geophysics up to the 40's, our discovery rate was about 5 or 6% and that was out of 100 holes, 95 were dry. Now in Canada, it's fantastic, some people have as much as 80% or 90%. The overall average is better than 50% discovery rate which is fantastic. In virgin areas, new areas, this is much lower of course, 10, 15, 25 area, but that's a tremendous improvement because of the technology in our hand, our added knowledge.

End of tape.

Tape 5 Side 1

JW: You left Century and retired in effect, in 1971 and came up to Calgary then and started your own consulting business. I wonder if you could just outline quickly the kinds of activities you've been involved in since '71, you've sort of diversified a little bit.

PB: First of all I didn't retire, I quit.

JW: Okay.

PB: that's for the record, it's not important one way or another really. I was unhappy with the conditions Century was being directed by the Board of Directors and associated electronic companies. So without going too much into detail on that, I got to a point where I was under tremendous pressure from the Board of Directors, from the electronics company people, from stockholders, from bankers and what have you. I got to a point where I really couldn't even sleep in peace at night. This went on and on, one day I woke up in the middle of the night and said, is that worth it, to heck with it, I'm going to quit. Things weren't going right, I would try to do things, the Board of Directors would block me and I couldn't understand or visualize why, I always tried to do things and they worked, the majority of them worked. This way everything I tried is being stopped, a big wall in front of me. I found out from other associates and the banks and so on that the Board of Directors were undoing things I was doing or making it difficult for me behind my back, so I quit. In all fairness I had a family problem, got divorced, that added to the unhappiness. So I thought, well, I got a lot of friends in Canada, I like that country, I'm going back there and start consulting. I'm too old to start working for another company, I guess I could have gotten a job but I thought I'll try on my own. So I set up my consulting firm here and I talked to a few of my friends. Really the only time I have made business calls or calls to obtain business, since then I did. Well somehow, one of the friends I know, knew somebody else, he was a lawyer in town here and the Danish people were interested in exploring offshore Greenland and they were looking for somebody and they called me for an interview. To make a long story short, they selected me among other people they interviewed. So that was a real good job. I acted as their exploration manager, I managed a geophysical, seismic survey offshore in the western half of Greenland. I helped them to get partners in the seismic surveys to minimize their cost. There turned out to be five companies interested in it through my connections and my friends. So instead of costing them 100%, it only cost them 20%, 1/5. So the time came, the concessions were given, I evaluated, did the interpretive work and I had some geologists help me too under me. And the time came to form a consortium with this Danish company which was called GREPCO, Greenland Petroleum Corporation and I helped them to get some other oil companies to become partners, others helped as well in that. So we got a group of people and we got the concessions, the ones we wanted, through that GREPCO, because they are Danish we didn't have too much trouble with the government there. And we had to do, in order to make a location for drilling, we had to do more geophysical work, we did that, I helped them with that as well and the partners. And we made the location and we drilled and unfortunately that was dry. Like us, there were five other groups that drilled in the same area, there was an Arco group, California Standard group, Mobil Oil, ourselves and one more, I forget now. And they also drilled, they all got dry holes. So of course, that discouraged everybody and the acreage was turned back to the government and so on. It sort of died in that area there. But in the meantime, I got involved with other oil companies doing work here in Canada, seismic evaluation, interpretation and geological and seismic integration where I feel a) it's necessary, b) I think I can do it and I do it, I like to do it. So I work for Sol??? Petro as their geophysical consultant, they didn't have a geophysical department. The plan was I

would help them and when they got to a point where we all felt they needed a geophysical department then I would help them to set up one. And it worked that way and I'm pleased to say that I think I helped them to be successful in their exploration endeavours. And then the time came to set up their geophysical department. I helped them to interview people and so on so they set up their geophysical department and even then they used me as a consultant for awhile and then they got into this trouble so that ended there. So this GREPCO deal and Sol Petro deal was really two major activities I had which took about 80% of my time. And my time was long time, in nights and weekends. And then I also did some work for other smaller companies and so on. And in the meantime I had been involved with Century in the application of seismic method in evaluating potash deposits in Saskatchewan. And I was working for these private companies, Duval??? was one ??? was another one. So they knew me and they had a problem, they asked me to help them, so I went and got with these private companies. Which subsequently were bought out by the Saskatchewan government, they called the company then Potash Corporation of Saskatchewan, PCS. Of course, the people were the same, so I just continued on going. So I have done a lot of work, I'm still doing a lot of work for potash. If I may say so, perhaps I'm the only practical applied geophysicist for potash deposits. The reason I went through all these words is that they do have a professor in Saskatchewan who is very theoretical and he has been involved in potash work but he is highly theoretical. Theory is one thing and economic applications is another thing. So not only I had the experience but working with them I developed more experience and more ideas and more new things and so on. Which in a way I hate to see it because I'm not going to be here forever. I have written a few papers and so on, I intend to put some kind of brochure. . . call it a book or pamphlet, if you like. . . how to explore for, with seismic, potash deposit, how can you solve the problem and so on. Anyway, so one thing led to another, so I have been working for PCS mines which is Rocanville??? Division, Lanigan Division, Cory Division which is all Duval and they had plans to develop Brattenberry???, I worked there. Finally the government changed and the new government, Conservative Government decided the province shouldn't be involved in developing new mines and private industry so all that money they spent is gone now. But the information is there, we worked to a point where they could start opening the mine. In fact, they had bought the land and the houses on the land and so on. So these are the areas I worked in, I worked awfully hard and the last 8 months I began to think there are a lot of other things I want to do in life too, I should have a little more time for myself. So I'm not phased out but I am cutting down considerably. I still working 5 days a week or 4 ½ days a week but the regular hours. I don't like to work under pressure so I don't take anything that is urgent and they want an answer tomorrow or the next day, I say sorry, I can't do it for you and so on. So gradually I will phase out I'm sure but as long as I have my health, I'll be 71 next month, but I feel good physically and as long as I have my health I will continue to work, maybe a little lesser than now. So that's the way that is.

#121 JW: One of the other things you've been fairly involved in, I understand, is various training programs, for the United Nations, you mentioned SAIT. . .

PB: Oh, that was in the early days, in the 50's and 60's, late 60's, yes. I taught school on a voluntary basis, I wouldn't accept any money for Mount Royal College, they were down on 7<sup>th</sup> Avenue here. The professor. . . teacher. . . had left them and they didn't have anybody so they asked me. So I said sure, I'll be glad to help you out, so that went into 2 or 3 years. And then they wanted to give a course to the secretarial school they had there, they had a very good secretarial school and they wanted to have these young girls, in fact there were two boys too, taking a secretarial course, they wanted to give them an idea as to the terminology used in the oil business. So they wouldn't be foreign to the vocabulary of the oil industry. I thought quite a bit how to make a course like that interesting, instead of saying ??? bushing means this, you know, so I had to make up little stories and so on. And there was a little joking, for instance, when I mentioned mud engineer, there was a silence, they didn't know whether I was joking or what and then I said, don't be surprised, there is a mud engineer and it takes a lot of studying and so on and so they all laughed. I see some of those girls, of course, I've forgotten them but they recognize me and they're still in the industry. I did that and this United Nations bit, really that was in relation or a continuance of our Tulsa office's. . . . one guy was involved in that, and I got the idea from him and the connections with him. They got to know me in Canada, I was here, so I did the Canadian part of it with that fellow, James Bentley Llewellyn, he's an Englishman, he's in England now. I enjoyed doing that very much and I was very, very grateful to the oil companies for accepting these boys. They brought them in here under several plans, United Nations, Columbo??? plan and others. And they accepted them, they showed them, they trained them, which, you know, was a little burden on them because they have to do their own routine work continuously and this distracted their people but nevertheless they were very cooperative. The industry was very, very cooperative. And then some people wanted to go overseas, the United Nations of course, they circulated who they wanted. I was influential in sending a few people overseas especially nearly retired or retired people that had a lot of experience. They really appreciated it. It gave them a boost for their ego, being wanted. And they did very well, they were all limited duration, six months, a year, two years, some were three years. I enjoyed doing that, helping them out. Of course like everybody else, when you have children you get involved with the Boy Scouts. I did that, we sold Christmas trees, babysat different boys when mother and dad were attending cocktail parties, it evolved to that. But nevertheless we helped the kids, that was the main thing.

#171 JW: Looking back on your career, which has been really very, very interesting and lots of diversity, could you single out one or two things that you would consider as highlights?

PB: Well, several, I'm trying to think which. . . . Well, first of all, let's go chronologically. Again in the old days of principals, the philosophy was different. After graduating as a geological, geophysical engineer, my first job. The company that gave me the job, they sent me to their research laboratory. I was quite happy, fresh out of school. Then I found out what I had to do. What I had to do was, there was a big room, apparently they had a big fire there previous to my arrival, and in order to put out the fire they dumped all the screws and nuts and bolts and there was a pile believe me, about twice the size of that

desk and about as high as five, six feet. And they had a bunch of drawers on the side. They put one of each kind of screws and bolts and they said here it is, go to it, separate these bolts and put them in the right cubbyhole. So I said okay, knowing that in those days, that's how. . . they were testing your patience and so on, at least that's what I thought. And then another guy came and so the two of us, we did as much as we can, we couldn't even make a dent on that pile. And then finally they sent me out on the crew, I said, goody, goody, that's what I wanted to do. Well, this was a highlight because you know, you think you're a big general when you finish school and they knock your head down and say you do this kind of work. And then when I went to the crew, similar to this, same thing, the Party Chief said, well you're going out with the drillers, you help the drillers. So there I went with the drillers, dirty mud and I was digging in ??? holes, this is shot hole drilling, smaller scale. And after that of course, bang, bang, bang, everything went all right. So this was one of the highlights. Then the other one, a highlight in the sense of personal satisfaction. I went back to Turkey, like I said before I had an obligation to meet and I helped them, with the help of other people, to set up their geophysical department and train seismic and gravity crews. . . , to a lesser degree electrical methods, there was another guy who was quite capable of doing it. . . , but particularly seismic and to a lesser degree gravity. That to me was a great accomplishment because you've got people who hadn't even heard the word geophysics and we trained them. And they became very competitive, we hired the American United Geophysical alongside our crew and believe me, in quality and quantity and cost, they were very competitive. That gave me a tremendous, good feeling. And perhaps being involved in Canada with any place north of Calgary really was a new area, frontier area you might say. Not in the geographic sense but in the technical sense. It required a lot of thinking and speculating and what have you. And everybody was in the same boat, so that was interesting. To be challenged by so many unknowns and do the best you could and a few little successes here and there, they made you feel good. I think these are really. . . . And I enjoyed my work with the Europeans, which for the same company I did some work in the Mediterranean and the North Sea and so on. It was different, diversified. And I enjoy potash work too because it's a little different, although the same principals apply, it's a little different approach. You do the same thing for 45, 48 years and you welcome a little difference. As you can see, there really hasn't been any striking highlight of any sort, all exploration related, which I enjoyed, I still enjoy. I wish I had hobbies.

#249 JW: Well, it's not too late for that either. Well we've covered quite a bit of ground here

in the last couple of sessions. Are there any areas that you feel we should cover more thoroughly or areas that we've missed that you'd like to . . .

PB: Well, perhaps I might have word of advice for the new generation. Be aggressive and try to resolve the problems to the best of your ability and work with your associates together. Don't over stretch the capability of the tool you have in your hands, namely seismic instruments and recognize the fact that the old generation has worked very hard to bring the geophysics to this point here from which you are capable of doing a lot more things. It

didn't come overnight here, in all aspects. And always try to cooperate and work with the geologists and understand the geology and geological problems. You have a tool that is used to portray the geological conditions so use your seismic information to tie into, to correlate with the geology. That's when you're going to be successful. When I say you, I'm talking to the young generation. And don't give up easy.

JW: Okay, well Peter, thank you very much for this.

PB: Well, thank you for giving me the opportunity. I hope after I'm gone, these thoughts can be of some use to somebody.