

PETROLEUM INDUSTRY ORAL HISTORY PROJECT
TRANSCRIPT

INTERVIEWEE: Bill Gussow

INTERVIEWER: David Finch

DATE: October 2001

DF: Today is the 26th day of October in the year 2001 and we are with Dr. W. C. Gussow at 322-20 Cleary Ave. in Ottawa. My name is David Finch. Could you start by telling us where you were born?

BG: Yes, I'll give you an outline here and the top two pages are the ones that you sent me.

DF: Oh good, okay. Can you tell us some of this on . . .

BG: I worked it out systematically there, I think you can read that but you can still answer lots of questions.

DF: Okay. So we have, as part of the record here then, attached to the notes that go with this interview, a set of notes that Dr. Gussow has provided about his early period. But tell us what got you interested in geology?

BG: Well, it's in there.

DF: We'd like you to tell us if you would?

BG: Well, it's there. It's written out in detail without any . . . that's just extra paper, it's just one sheet.

DF: Just the one sheet here.

BG: You can read it out which is . . .

DF: Would you mind doing that?

BG: All right. I was born in London, England in 1908, April 25th, 25 Beulah Hill, Upper Norwood, London, England. My parents are H. T. Gussow, botanist who was at Kew Gardens, London, England and Jenny Maria Gussow, mother. H. T. G. was asked to go to Ottawa, Canada and became the first Dominion Botanist of Canada. I had one brother, Fred, now a resident in Florida, three sisters, Linnea, Amra, Elisabeth. Elisabeth is married to Ronnie D. Grant and lives up the Gatineau River. I grew up in Ottawa, went to public school and high school and joined the Geological Survey of Canada as a cartographer. I was sent to Sudbury to map the Sudbury area using the first aerial photographs made in North America, made the first map of Sudbury. These maps were used as first base maps for geological survey of Sudbury by Dr. W. H. Collins, Director of the Geological Survey of Canada in Ottawa and I became his assistant. When the maps were finished I went to Queens University in 1929, got a B.Sc. In 1933, Master of Science '35 in geology. In 1935 I went to MIT for my PhD in geology. I went to work for Shell Oil, Union Oil of California, province of New Brunswick as petroleum consultant. In 1938 I retired in the USA and went to Japan as a consultant for the Japanese government in oil, in 1971. In 1973 I retired and came back to Canada. I discovered and published "Differential Entrapment". That's just a short basic outline covering. Now, I've got all these records here and I don't know what you would like. This first letter here is recognizing my 50th year as a member of the AAPG.

#040 DF: And what year was that?

BG: That was '96. This is the final proof of the edition. If you want you can have that copy.

DF: Okay, that's the Canada Who's Who, good, that's very good.

BG: This is Who's Who 1999 and it just has, I don't know if there's any changes or anything there, I don't think so, it's just updating it. You can have that if you want.

DF: Okay, another list of accomplishments. What we'd like you to do today though, is talk about what got you interested in geology.

BG: From that you can see that I finished high school and was hired by the Geological Survey as a cartographer and I went to work in the Geological Survey as a cartographer. I was completely surrounded by geologist. All my interests from then on were geological. I had these aerial photographs which had never been made before. It was after World War I, the British Air Force came to North America with their planes and did aerial photography and they landed in Ottawa and the Director of the Survey, Dr. Collins, naturally decided that the Sudbury basin, where he was working was the first place they wanted aerial photographs. So they did those first and then they went on to California and started doing them in the States. But as I was already working as a cartographer Collins got me in to work with the aerial photographs and make the basic maps and then, in the summertime he went out in the field and did geological work and he brought me along because he wanted me to plot the day's work on the maps as he was going along. So you can see, I was very interested in geology and in mapping and in Sudbury particularly. That went on for about 3 years, the mapping. From the aerial photographs we mapped the topography, the streams and shorelines and lakes and outcrops and dips and strikes on outcrops and all things like that. Well, those were all very important in making the base maps because there was no imagination, it was right there you know. And that went on for 2 or 3 years, then when we finished that I decided I'd go to university and take geology. I did my Bachelor's and my Masters in the 3 years that they usually are. Then I decided to go to MIT and I went there and took my Doctor's. But you can see, from the day I left public school and started as a

cartographer and worked with geology, all my background was geological and interest in geology and working in the field with Collins. It couldn't have been more interesting. So there was really no other interest in my lifetime but geology. Then at MIT they were very impressed because I had a geological background and mapping and things like that and aerial photographs, background, more than any other student. To me I didn't have to think about what it was, I knew what it was. So that's how I got interested in geology.

#089 DF: There's quite a difference between hard rock geology and petroleum, how did you make that shift?

BG: Yes. Well, when I finished with MIT, Shell Oil wanted a geologist and they hired me. That's when I started my interest in petroleum geology. I did an awful lot of research and reading, you know, geological literatures that came out month by month and so on. I became quite important with Shell Oil but let's see what I've got here now.

DF: So where did Shell send you?

BG: That's coming in what's down here now. But there was another bulletin there that . . . I was ??? engineer on construction of a \$700,000 project and was in charge of field office, all construction contractors schedules etc. Office engineer in charge of engineering office on one of the largest hydro electric power developments in the world. Drafting and design builds of materials, schedules of construction, expedition of deliveries, quantities, contractors, cost estimates. I was cost engineer in charge of cost and quantities on construction of one of the largest munitions plants in the Empire, Chairman of a social and recreational club, having a large membership and more than \$11,000 revenue.

DF: So how did you get to be in Calgary?

BG: I'm coming to that. My experience in research, sales, mine valuations, teaching,

drafting, travelling are all outlined in this here. Then I give a chronological experience, 1926 to date, which is 1948.

DF: Could I have a look at that.

BG: Yes. All of these. . . .

DF: So you travelled all around the world didn't you?

BG: Oh yes, I've been everywhere in the world.

DF: So by the 1940's you were with Shell Oil in eastern Canada. 1948 you were Exploration Manager for Shell Oil. 1951 and '52 you arrived in Calgary, can you tell us about going to Calgary?

BG: Yes, I'll come to that in this . . . I went to New Mexico, to the Roswell Geological Survey. I went on a lecture tour of the United States and gosh, I went all over the place. I don't know if you're interested in that, a membership that came out in 1951. Again, an update of who's who in America, I don't think there's any big change in that.

#144 DF: Who were some of the geologists that were working in Calgary when you arrived there, was Ted Link there?

BG: Yes sure. I'll come to the part on Calgary and I'll go into more details then.

DF: Okay. ??? Academy in Milan, Moscow State University. Milan was 1957, Moscow State University, 1960, National Advisory Committee Research, Geological Science of Ottawa in '59, National Academy of Science and the United Nations Expert, Training Institute, Oil and Natural Gas in India, Honorary Awards. This is just listing all the events that occurred. Research in differential entrapment explaining accumulation of gas down dip, oil up dip and water only beyond limit of oil migration, called the Gussow Method of Enhanced Oil Recovery. That's just listed there. Now in '97 I was a 50 year member of the Geological Association.

DF: Association of Canada, yes that's good. And you're looking at an article there that

Aubrey Kerr wrote about you. I saw him yesterday too.

BG: Yes, he worked for me for a number of years before he resigned and started working as an editor.

DF: So can you take us back to those early days in Calgary and what was going on in the oil industry, in the early 1950's?

BG: Yes, I'll come to that. This was my pioneer award. That was an outline of my achievements in that time but I don't know whether you . . .

#180 DF: Maybe you could read this page to us, it looks like it's pretty important.

BG: Yes. In 1954, I published a ??? paper on differential entrapment of oil and gas in our Bulletin, with its emphasis on fluid flow, regional migration, paths for hydrocarbons and the displacement of oil and gas on a regional scale. This paper showed the way for petroleum system studies as we know them today. The lucid simplicity of his text was illustrated by now classical figures, such as the prolific documenting differential entrapment, along with hydrocarbon accumulations of the Leduc reef trend in Alberta, when today, all of a sudden, the importance of exploration for natural gas is rediscovered, managers may find out that Bill's paper still offers one of the best conceptual keys for a focussed exploration strategy for new discoveries. In 1987 and later, Bill obtained patents in the United States, Canada and the USSR, all aiming at recovering much of the oil that worldwide, still is left in the ground. Again, the Gussow Method is based on the concept that natural gas is ideally suited for the displacement of oil. Testing and application of the method could result in a dramatic increase of the recoverable reserves of the world, thus lifting the gloom spread by folks who want to convince us that soon we'll be running out of oil. Bill's career followed the tradition of the early Canadian petroleum thinkers of the 19th century, like Sir William Logan, who already, in 1942 noted that oil shows in Gaspe were tied to anticlines and ??? Hunt, who in 1961

developed the anticline theory. Alas, there isn't enough space to recount all the ??? long and fascinating life. Born in London in 1908 his family soon moved to Canada when his father was appointed as the first Dominion botanist. He obtained B.Sc., M.Sc. Degrees from Queens University in Kingston, Ontario and a PhD from MIT. His early career included surface mapping with the Canadian Survey, mining projects and engineering geology associated with hydroelectric power developments. In 1945 he joined Shell Oil Company and worked in eastern and western Canada. In 1956 he joined Union Oil Company of California and stayed with them until 1971. So far, Bill has failed to retire. Bill's wisdom ??? experience and travels are worldwide. He lectured in many countries, including an AAPG distinguished lecture tour in 1955. His thoughts are reflected in a long list of publications that have been recognized by the many honours he has received. Most recently, in 1998, Bill received the Honorary membership of American Institute of Professional Geologists, of which he was a charter member and in 1999, the Stanley E. Slipper Award, the highest of the Canadian Society of petroleum Geologists. We got to know each other in the 50's and 60's in Calgary. I fondly remember, during the long Canadian winter, the great discussions we had on just about any geological subject. At that time Bill had developed a particular interest in the unconformity at the Cambrian, pre-Cambrian boundary, the paleon interval. We also dated the degree of basement involvement in the structure of the Rocky Mountains. Short orogenic??? phases, versus protracted deformation catastrophism???, which did the woolly mammoths and the ??? die so suddenly while still chewing on buttercups. This and so many other topics. Like some early naturalists there never was any limit of the scope of Bill's interest. Always a passionate and persistent protagonist of often unorthodox views, he often supported them with his own keen field observations. To this date Bill is, for so many of us, a classic role model, always coming up with new, often startling ideas and generous in sharing his experiences with others. Perhaps most

of all, we appreciate his kindness, his friendliness and his gentle sense of humour. As a thoughtful incisive visionary thinker, Bill needed a great pioneer who was in the middle of the past century help craft geological exploration, strategies which will continue to have powerful influence in the 21st century. That's A. W. Bally, Bert Bally.

#245 DF: And what was that done for?

BG: That was . . . I got the Pioneer Award from AAPG and as Shell's former head of research in origin and migration of hydrocarbons, I found your work to be way ahead of its time, my congratulations on your award, Marlon W. Downey, President Elect, AAPG.

DF: That's very good. So how did you first hear about the Alberta Society of Petroleum Geologists, do you want to tell me about that?

BG: Well, I was hired by Shell Oil and sent out to Calgary. Then naturally I heard all about the goings on of the Alberta Society and became a member. From then on, I had a more active administrative connection with ASPG.

DF: So how was it you came to be President in 1959?

BG: I guess my activities and lectures that I gave to the meetings of the membership and they just asked me to be on the executive. It wasn't any of my doing.

DF: Oh, I think you had something to do with it.

BG: Yes well, I don't know, are you interested in pictures at all? American Association of Petroleum Geologists.

DF: Right.

BG: And here again more pictures.

DF: More awards, yes, good.

BG: This is Grover Murray. Grover Murray was head in the AAPG. He was responsible for the nomination. . .1955, '56, you may be familiar with my differential

entrapment, which I gave on my distinguished lecture tour. I worked this out in the early 1950's and A. I. Leverison suggested I give a distinguished lecture tour, which I did in 1955. He also stopped printing of his new textbook to add a few pages outlining the principal of differential entrapment, now recognized as law of nature. I attended a lecture for students at San Antonio a few years ago and the first speaker, a Shell engineer, began by saying, you students better learn that geologists are a liability for the oil companies. They never made any money for oil companies. It is only the engineers who produce the oil that make the money for the oil companies. Well I said, how come, the geologists find all the oil, 100%, but the engineers only produce 30% of the original oil in place on a world average. I consider this deplorable and unacceptable. I discovered why and there are many abandoned oil fields in the U.S. with 90% of the original oil in place left in the ground. I worked out a new method of oil recovery that will recover all the original oil in place and was awarded a U.S. patent in just 6 months, on a priority right.

#321 DF: So can you tell us about that method?

BG: Yes. That is by injecting . . . well, first of all, water will displace oil but water only displaces about 50% of the oil, the rest of it is abandoned. When gas comes in, gas displaces the oil and the water and gas will displace almost, well over 90% of the oil in the oil field. The only thing is, the way the gas is injected, like Shell started injecting gas under pressure, well, it broke up the oil column into, no longer a continuous phase. And it only recovered about 20% of the oil that was left. You had to inject the gas under control so that you don't exceed the gas pressure in the oil field and the oil goes out slower but you recover 100% instead of just the 20% that Shell was recovering. That's more or less a short outline of it.

DF: That's great. Where did you get this idea?

BG: Just working with it in my mind. We made a model and we injected the gas slowly

into the model and we displaced all the oil out of the model, recovered it all. Whereas if we injected the gas under pressure and churned up the oil, only a small part of it was recovered. It was just that way, working with lab models inside, in the office and I had to read an awful lot of literature. It's interesting, in southern Ontario there's a lot of gas fields, well those gas fields were once all filled with oil. And the gas displaced all the oil out of those fields, moved it updip. So the oil fields updip are filled with oil and have gas below the oil column. It just shows the example in the field, how down dip you have all gas accumulations, further updip you have all oil accumulation and then further updip you have all the traps filled with water because the oil hasn't moved updip any further. And of course, if you produce the oil it doesn't go any further updip. It's just thinking and trying out things.

#370 DF: Experimenting?

BG: Yes.

DF: Can I have a look at it?

BG: This here, I don't know if there's anything in here, there's just these pictures that I showed you.

DF: Yes. That one section you read, is there any more like that in there about you?

BG: I don't think in here.

DF: No. Is that what you were honoured for was that method?

BG: Yes.

DF: By this group, American Association of Petroleum Geologists?

DF: Right. Good.

BG: What have I got here? No, that page has been removed.

DF: How about in that publication there, it says something on page 16?

BG: As Assistant Program Director of the Society I am part of the 9 person Executive committee that directs the operation of the Canadian Society of Petroleum

Geologists. While I was considering the potential topics for my first exclusive column I settled on the topics of the benefits of membership in the CSPG and we can all do to make the Society even better. As most of us are aware the predecessor, the ASPG, the Alberta Society of Petroleum Geologists was founded in 1927 by a group of far sighted geo-scientists. They found the ASPG as a mutual support group to help foster the spirit of scientific research among the petroleum community in Alberta. 71 years and a Society name change later, in 1973, the CSPG continues the original tradition laid out by its founding member, S. E. Slipper, T. A. Link, D. Warren, W. M. Hunter, F. B. Hayk. The Society has grown over the past 71 years to serve a broader audience with over 3,000 members resident in Canada and 30 other countries. The Society has become the envy of many other professional societies, both nationally and internationally for the high level of professional excellence and commitment of its members, a fact that we all, as members, can take great pride in. A recent advertisement slogan stated membership has its privilege. What this slogan did not however, emphasize is the flip side of the argument, that its members also had its obligations and responsibilities. Membership in the Society is a privilege that carries with it certain obligations. Each member is obliged to hold a code of conduct of the Society and its responsibility for assisting the Society in reaching its goals. The Society has established 4 goals to guide its activities, the individual members, the advancement of the science of petroleum geology, the promotion of the awareness of the role of petroleum geologists, and the promotion of activities that strengthen the community of petroleum geologists. Each of us, by virtue of our membership in the Society has agreed to uphold and assist with the goal. The key to success in reaching our goals lies in the members continuing and strength of their commitment to the Society. As the Society's assistant program director my specific responsibility is to assist the program director, Mike Webber, in overseeing the operation and action as liaison for

the diverse member program that operates within our Society. The program are of the Society includes the official publications of the Society, the Bulletin and the Reservoir, technical luncheon committee, the CSPG online service. If you do not visit the site, please do so, the address is . . . many thanks to the CSPG online committee and Glen Carn at Canadian Pacific Petroleum for all the work they have done. The continuing education committee, the one day field trip committee, the 9 technical divisions. What can each of us do to assist the Society reach its goals, we can all make sure that our companies and our personal membership are kept in good standing so the Society can take advantage of the numerous opportunities provided by the Society for the personal and professional development by reading the Bulletin, the Reservoir, other Society publications, by attending the technical luncheons, divisional meetings, conventions, continuing education, seminars and one day field trips. And of course, volunteering to assist Society programs. Just call the CSPG office and let Tim or Deanna know that you want to volunteer to help out. We can all lead by example by helping to mentor and direct the career of young petroleum geologists and high school students. We can all think of individuals who made a difference in our own career who have profoundly influenced us and even made us change direction. It is important that we pick up the torch that has been handed to us by people like Stanley Slipper, Bob Douglas, Ted Link, Andy Baillie and start to mentor the new membership of the Society. A good place to start is to talk with someone of our more senior members. I would encourage members to search these members out at the technical luncheons and to probe the depths of their collective wisdom in solving today's problems. We do not want to lose this vast collection of wisdom, especially since many companies no longer have in house training, mentoring programs, exec programs that most of us ??? our career benefits from.

#490 DF: Can you tell us who wrote that?

BG: Paul R. Price, CSPG Assistant Program Director and this was in 1998 in the Reservoir. [woman's voice in background] Don't get yourself all worn out. No.

DF: Would you like to take a break and have your juice.

End of tape.

Tape 2

BG: Important conclusions. The east Texas field is a stratigraphic trap resulting from a sedimentary de structural flank of the Munro uplift. The lower Cretaceous strata of the Munro uplift were domed to produce lower Cretaceous time and were eroded and truncated until Jurassic and older strata were exposed in the core of the Munro uplift. The Sabine uplift is actually an eroded triplegraphic??? high which was an island in Woodbine and Eagle Ford time and persisted as a topographic high in some parts throughout much of Austin time. It falls from two above that the Austin lies unconformatively on truncated strata of lower Cretaceous age, over most of the Sabine uplift. This gave rise to the concept of a major pre-Austin unconformity. In reality as will be documented in the body of the report, there is no regional erosion unconformity at the base of the Austin, except over the Sabine uplift. The age of this unconformity is pre-Woodbine and post-South Tyler. There was little or no erosion in pre-Austin time or during Austin deposition. The pinch out of upper Eagle Ford member below the Austin is positional and not truncation. These members never extended any farther east and are not truncated by erosion. In conclusion the Woodbine shoal facees should continue all around the Sabine uplift and oil and gas accumulation can be expected wherever stratigraphic closure occurs.

DF: That's good.

BG: That's half of it. On the regional basis the Cretaceous outcrop from Mexico to New

York and beyond on the Continental Shelf, is an eroded edge so that any east Texas type traps have been destroyed. The problem is to try and locate any other Sabine uplifts in the subsurface where upper Cretaceous positive areas exist. It might also prove worthwhile to try and locate any stratigraphic closures in the Woodbine pinch out along the south side of the Sabine uplift in Tyler, Jasper and new countries, Texas and Vernon basin in Louisiana. As a result of the following studies just completed it is concluded that the south Tyler formation is a valid unit of Comanche age which can be mapped and correlated just as well as any other lower Cretaceous unit, with the recognition that the south Tyler formation, everything falls into place and we have a comprehensive figure that fits the regional geological picture. The south Tyler formation and the Woodbine are limiting beds of the mid Cretaceous unconformity which is recognized throughout the Gulf region. A revised table of formation, Table 2 is shown on page 24. The Eagle Ford rapids are age equivalent and are essentially conformable with the overlying Austin and the underlying Woodbine. Migration and accumulation of oil and gas in the east Texas basin occurred at about the end of Cretaceous time and is in accordance with the principle of Differential Entrapment. The overall picture that is of gas in down dip traps, major oil accumulations updip with dry structures farther updip beyond limit of oil migration. Oil in the east Texas field remigrated to its present position throughout tertiary time. The east Texas basin is about the same size as the Kaibul??? basin in Venezuela. Both basins had areas of basement relief similar to the Sabine uplift.

#040 DF: Did you ever work in South America?

BG: Sure. For Union Oil Company I worked . . . what was this here?

DF: That's a file of Who's Who, we don't need to go into that. So what can you tell me about your time out in Calgary?

BG: I would say that all my spare time was devoted to exploration for oil and gas and

working out geologically the time of accumulation and things like that. I published quite a few papers while I was in Calgary and that's how I came to be invited to go on so many lecture tours.

DF: Who were some of the other geologists that you worked with?

BG: I mentioned some of them in this last article there. They were working for different oil companies but they were interested in my views and we spent a lot of time together discussing them.

DF: Where did the ASPG meet when you were President?

BG: In different school areas. . . there were lecture areas in Calgary that we went to. I found that everybody in Calgary was interested in the future of the oil industry naturally. I'll take a few sips.

DF: So the oil industry was pretty busy in the late 1950's wasn't it?

BG: And still is, isn't it?

DF: It is.

BG: Articles that I worked out for Shell Oil and for Union Oil were released for publication in the AAPG bulletin and other publications. So that, after they were published I was free to discuss them all you know. On the whole people, the geologists of the Calgary area were very attentive and discussions were worthwhile. If there was anything that didn't hold out it came out in the discussion. But I didn't have much to withdraw.

DF: Good. How else did the ASPG benefit the geologists in your time period?

BG: They gave regular lectures every month and it was a wonderful place for all the geologists to get together and they did. Lectures were good and interesting so they were well supported.

DF: Publications were important too, yes. How about the social events, were you a golfer?

BG: No. I did play a little bit of golf but I didn't go into golfing like the golfers do, just to

be sociable.

DF: Do you remember anything else about the ASPG during the 50's and 60's?

BG: All I can remember is, it was a wonderful scientific Society and it was devoted to the improvement of knowledge of our geological science. There were geologists from all the other companies that came together to discuss problems. They didn't jeopardize their connections with their companies, they improved the situation if anything, for people in different companies. I think that the Alberta Society did a great deal to help the knowledge of the geology for the Calgary area.

DF: Anything else you'd like to say about your career?

BG: No. Of course, the Alberta Society had members visiting from other Societies and they would hear different lecturers give lectures and invite them to come down and give lectures to their societies. That's how I got invited all over the place too. It warmed up the whole picture.

#100 DF: Do you have any regrets from your career, anything you wish you could have done?

BG: Oh no. My only regrets are aging. Like now, my memory is going away, I can remember 20 years ago but I can't remember the last 10 years, important things. They come to me like, you might turn around and the next minute I remember something but it just doesn't come at the time. But I loved geology and I loved the geologists I worked with. They would send me lots of reprints of papers they'd published so that I could read them and discuss them or get new ideas from them. It was a very nice warm geological society and it was good for the oil companies. Of course, if there was anything that the oil companies worked out that they felt was in their interest they wouldn't give it in a lecture, they would keep it quiet for themselves. On the whole geologists were working in the interest of their company and they wouldn't discuss things that didn't work out a problem for themselves that

they were trying to figure out, they might bring up a question whether other people had any ideas. But when they got an idea that it was really of advantage of improving exploration methods then naturally they didn't discuss those. I never regretted any time that I spent in Calgary. I liked it there too because my wife and I used to go into the mountains, like on a Sunday and go hiking and I would look at the geology and

DF: Well, thank you very much. On behalf of the Canadian Society of Petroleum Geologists and the petroleum Industry Oral History Project.

BG: You're very welcome but if there's anything else you want in any of these . . .well, I gave you most of the print outs, the Who's Who and so on.

DF: Right. So we'd like to thank you very much for spending time with us today and if we have any more questions we'll drop you a line and maybe you can answer those questions for us too.

BG: I'll try.

DF: Thank you very much.

BG: I sure will.