

Thomas Burke Hayes

His Early Life and Career

with

CH2M HILL - 1984

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INTRODUCTION

Thomas Burke Hayes, an only child, was born in 1912 in Pendleton, Oregon. His father, who was an avid reader, musician and outdoorsman, had a significant influence on him from the outset. The younger Hayes was inclined toward these interests, as well as working with his hands.

The father, who was a civil engineer, spent his entire career working in Union and Umatilla Counties, Oregon. He strongly encouraged his son to study engineering; his mother was also very supportive of getting an education. Another important influence during Hayes' formative years was Willard Geer, a high school physics teacher. Geer guided him toward a technical vocational choice. With the support of his parents and teacher, coupled with an analytical mind and an inclination toward tinkering, Hayes choose engineering as his life's work.

In 1930 Burke Hayes enrolled at Oregon State College to study general engineering. After a year and a half, however, economic hardships brought about by the Depression caused him to quit school, return to Pendleton and seek a job. A career in the U.S. Navy appealed to him so he tried, but failed, to be admitted to the U.S. Naval Academy. "I was interested in ships and I was interested in things that they had done... I was just interested in the Navy, I'm still interested." For four years he worked at odd jobs in order to make a living. Some of these were washing windows, driving a truck, working on a farm as a laborer, and serving as a draftsman. He got his first taste of running his own business when he established a surveying business in Pendleton in order to earn money for further schooling.

In 1936, much more mature and serious about his life's direction, he re-entered O.S.C. "I'd had too much trouble putting money together to get back in school to fool around. The Depression aged a lot of people." Hayes had decided that electrical engineering was the most attractive, therefore, he enrolled in that department's curriculum. While at O.S.C. he met fellow classmate James Howland; it was through the course of this early friendship that the idea of opening an engineering office together first surfaced. Holly Cornell was also a classmate and acquaintance although Hayes did not know him as well as he knew Howland. While living in Pendleton, Hayes had also known Fred Merryfield, a much respected engineering professor; Merryfield and his father had been good friends. Hayes could not have known that these individuals would become the principals in a future engineering firm.

In 1938 Hayes graduated as an electrical engineer. That summer he married his college girlfriend, Lenore (Billie) Reynolds, then headed for M.I.T. for graduate study. While at O.S.C. Eugene Starr, an engineering professor, had interested him in the field of power system analysis. This was the specialization that he studied at M.I.T. James Howland was also studying at the same university at that time and they continued their discussions about establishing their own business.

With the completion of graduate studies in 1940, he took his first job with the prestigious Boston engineering firm, Jackson and Moreland. He initially worked in the analysis department, then after about a year, he wanted to get some design experience. In 1941 he resigned from Jackson and Moreland and took a position with an Oklahoma firm, W.R. Holway and Associates. Shortly thereafter in 1942, because of the outbreak of World War II, he was commissioned in the U.S. Navy.

For the first two years he was mostly occupied with the teaching of electronics at M.I.T.; in 1944 he was sent to sea as an officer in the combat Information Center. He remembered this experience as being immensely enjoyable. With the end of the War Hayes had many job opportunities, however, it was still the dream of working in his own business that most attracted him. He recalled a conversation between Merryfield and Howland concerning this: Fred said, "Gee, Holly and I were planning on doing the same thing. Why don't you and Burke join us?" Basically, I think that's how the four got together. By 1946 the four engineers had joined together and opened their door for business in Corvallis, Oregon.

—and their contributions. Hayes reflected, "I have tremendous confidence in all of the six originals, (Cornell, Howland, Hayes, Merryfield, Rice and Roderick) and probably no more overall in one than I had in another." He noted the support and cohesiveness of the group: "...everybody reveled in everybody else's success and enjoyed the other person's success... it was a team effort, and it was the product of the team that made it successful and not any one individual." Some of the other discussion topics were the merger with Clair Hill and Associates, highlights and difficult times for the firm, moments of pride, the role of engineers in society and memorable projects. In assessing the firm's activities he noted, "...basically, the most important thing that we have are the projects that we work on. They are more important than the offices and the disciplines. It's the project that's really fundamental. "

Hayes discussed his own contributions to the development of the firm. He was the only one of the six who was not a civil engineer; his expertise in the electrical and mechanical engineering fields provided an advantage over similar companies in the Northwest, because it opened additional avenues of work. Because of his previous experience working with consultants, he was able to formulate certain key office procedures: "...the computation paper, the business forms, the time sheets...". He built the firm's first printing machine, which was in use for several years. Among the numerous projects he was involved with as manager, analyst, inventor and designer, one of the more significant contributions he made was the invention of the Flomatcher.

He retired in 1980 from full-time work, and he continues to enjoy a myriad of professional and personal activities. For example, he has investigated future energy alternatives. "I firmly believe that the big future in our energy problem is in fusion, not fission." He continues to work part-time as a consulting engineer on CH2M HILL projects. He also has strong intellectual

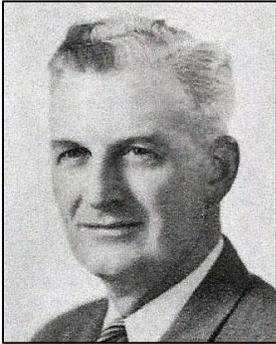
interests in twentieth century history, the genealogy of his family, and his own research. He and his wife enjoy traveling. His property on Triangle Lake (Oregon) and tinkering on personal projects are other interests which compete for his time.

One insight into the founding of CH2M HILL is reflected in Burke Hayes' thought:

There is, you know, a facet to being your own boss: to some degree controlling your own destiny, making your own decisions, developing your own organization, leaving something behind you, your own a castle of some kind.

[Editor's note: The following is a summary of Burke Hayes' original memoir. The summary focuses on key events and issues that impacted CH2M HILL's history as recalled by Burke.]

EARLY LIFE AND EDUCATION



Burke Hayes

You were born in Pendleton in 1912?

August 25, 1912.

How did your parents happen to be there?

Well, Mother's father, my grandfather, Thomas Campbell, was a Scotchman who moved to Umatilla County and started farming way back about 1860 or 1870. Mother was the oldest daughter of, I think, six children. Dad's mother came out here as a little girl about 1838, 1840. They lived on Richardson Butte near Eugene—that's an abutment to Fernridge Reservoir—before there were any people in Eugene. The nearest people were in Salem.

How many children did your parents have?

One. I'm a spoiled only child.

You think you're spoiled?

Oh, I think so. Yes. I had my own way when I was a youngster. Around the house I got to do everything I wanted to do; there weren't any restrictions. My parents were the original permissive parents. If I wanted to do something, why I did it.

Did you have any hobbies?

Oh, yes. I always loved to work with my hands. And my father, at least, was really quite a student; he did lots of reading. I did lots of reading as a result of that. We had a lot of outside hobbies, outdoor living and so forth—the usual things. I was in the Boy Scouts. I didn't do very well. My father was not a golfer; he was a baseball player. Dad even played in Sousa's band at one time years and years ago.

Played what?

He was a trombonist.

Are your musically inclined also?

Not really. That was one of the things I sort of feel badly about. They asked me if I would like to take piano lessons: absolutely not; I didn't want to. I learned to play the piano to some degree just by ear. But I really wish that they had laid down the law and said, "You are going to take piano lessons." But they didn't; and I didn't take them; so, I'm the loser.

Sounds like it. What kinds of things did you do with your hands?

Oh, you know. All kinds of machine work and woodworking and things of that nature. Nothing very important, just a lot of fun.

I understand your father was a civil engineer?

Yes.

Did he encourage you to go into the field of engineering?

Well, he encouraged me to become an engineer. All through high school he was encouraging me to become an engineer. Actually, I had hoped at one time or another to study either medicine or law. But things were sort of difficult in the late twenties and early thirties and it was hard for me to see how I was going to make my way through four years of school much less seven.

Why did your father want you to go into engineering?

Oh, I don't know. I think, probably like most parents, he had the feeling that that was something that I would enjoy doing and that was something that he understood. I think that was the reason that he encouraged me to become an engineer.

So they discouraged you from going into law or medicine?

No, no, they never discouraged me. Dad just kept encouraging me to go into engineering, and he always used to talk about the possibilities of my going back East to school and so forth. Ultimately I did, as a matter of fact; probably more because of his encouragement in earlier years than for any other reason.

Who did he work for in town?

Well, Dad was head of the Water Department in Pendleton at one time; he was the city engineer in Pendleton at one time; he was the city manager in LaGrange; he was chief engineer of a large timber operation in LaGrande called the Mount Emily Lumber Company; he was county engineer in Umatilla County; county commissioner in Umatilla County, you know. Everything that he did was either in Union County or in Umatilla County in Oregon. That was his home, and that was the area in which he liked to work. And Mother liked Pendleton. She didn't really want to move away. She didn't like LaGrange very well and wanted to move back; and after three or four years in LaGrande, we did move back to Pendleton.

Did your father ever talk about setting up his own firm?

No.

That was never an interest of his then?

Well, I think he was probably interested but it didn't appear feasible, I think. Later on, after he had retired, he did set up a firm with a younger man. He couldn't stand the retirement, and he set up a surveying firm

with a younger man, and then after three or four years he sold it to the younger fellow and it's still going. But as far as an engineering firm is concerned, I'm sure he would have enjoyed it, but things have to be just right to do that, and they were never right for him. They were right for me. The time has to be right, the place has to be right; there are a whole host of things that have to be right or you have a problem.

That goes for most things, I suppose.

Sure.

What engineering field did he encourage you to go into?

Didn't. As a matter of fact, I started in school at the University of Washington and planned on taking aeronautical engineering. I didn't like it up there in Seattle very well. I wasn't there very long; can't remember how long. My friends were all down here and I think probably Dad had encouraged me to go up to the university; so I wrote him a letter and told him I was coming down here and he never objected. So I came down here and just went into general engineering I think it was that we had to take as freshmen. The real decision as to what engineering you were going to go into came in the second year. And he never complained about going into electrical. I am sure he felt that was fine if I thought it was fine. Part of the permissiveness (laughter).

Was your Mother employed at all?

No.

What did she want for you?

Oh, I don't know; it's hard to say, you know. She wanted me to go to school. She wanted me to finish school. Mother was something of an artist, very artistic. Dad was not. Mother had a real flair for decoration, decorating the house and things of this nature; something that Dad didn't have and I don't have. Those are the interests that she had so, you know, our interests were compatible but they certainly weren't similar.

Can you remember when you first decided for sure that you wanted to be an engineer?

I think probably as a senior in high school. Earlier than that I had been on the debating team at Pendleton High School and had an interest in law really, but I never could see how I was going to make it through law school. It was going to be difficult enough to get through four years of university without taking the extra two or three years of law school. I would hate to say that engineering was a definite second choice because I'm not sure that it was, but I did have an interest in taking law at one time.

And medicine, too?

Well, medicine was a minor. I think that might have been more of a flash in the pan. Law was something that I really was interested in, in the early time that I was in high school. One of the reasons I think was that math was never easy for me. I did only average work in math in most instances. I think I retained it, and I've used it more than a lot of people, but it was not easy. And I suspect that just from that alone that sort of made me wonder if maybe engineering was the right thing for me to get into. You know, I never really had a bad time but I was no "A" student in math.

You had to work hard.

I had to work hard on it. Those things that I learned, I managed to retain pretty well, but they didn't come easily. So I suspect that that might have had a bearing in my thoughts at that time, in high school at least.

The reason why you pursued engineering rather than law was because of the cost of the extra two years to go to law school?

That's right. I could see that it was going to be desperately difficult for my parents to put me through school; and it was. They put me through four terms and I had to put myself through the rest of it. I could see that that law school part of it for another two years was going to be even more difficult. And, of course, I had an interest in the technical side of things, always did have. So it was real easy to get into the technical area rather than into law.

I wonder what kind of a lawyer you would have made?

Probably not too good.

Why do you say that?

Well, I don't know. I think I did what I was best at. I have no regrets. I don't look back. (chuckles)

Were there individuals, other than your father, who were influential in your life when you were growing up in Pendleton?

Oh, yes. I was extremely fortunate in having some extremely interesting and extremely capable high school teachers. I think that Pendleton was probably very fortunate to have some of those people.

One of them, the most notable one, was a fellow by the name of Willard Geer. He was teaching physics in high school. As a matter of fact, I believe Willard Geer has all of the basic patents on color T.V., which he developed at a later time. He taught physics up there for a matter of probably a couple of years, and he had an extremely important bearing on things that happened to several people in the class.

One was John Isaacs who, I think, died just last summer. John was head of the Scripps Institute of Oceanography, and I'm sure Willard Geer had a tremendous influence on John. He had a tremendous influence on another

fellow by the name of Charles Rohrman. Charlie turned out to be a chemical engineer and is now up in Richland, Washington. I think he is partially retired. I think he has been with Batelle Institute. For a number of years, he was with DuPont back East. He really didn't like it back East so he came back out here right at the end of the war. But, you know, this fellow [Willard Geer] was absolutely fantastic—the influence.

In what ways?

Oh, you know, he could excite you to do things that normally you wouldn't do; you know, pursue things on to a greater degree. He really was a fantastic teacher, probably one of the finest teachers that I've ever known.

So did you aspire to go into physics?

No, no. He didn't inspire you to go into physics particularly; he inspired you to get into the technical area, you see. Whether it was physics or chemistry or applied physics, he really didn't care; but he was interested in getting people to move into the technical area.

What appealed to you about engineering? You said you decided to become an engineer when you were a senior. What were you seeing for yourself?

Well, you know, I think some people have an interest in solving problems: problems that other people have; problems that you have. It really doesn't make that much difference: it could be a problem with the automobile; it could be a problem with a radio; it can be, well, any number of just technical problems that occur in everyday life. How do you solve these? If this is a matter of interest to you, why, then you have an interest in technical matters, and if you have a flair for them, you may have those things that it takes to become an engineer. You have to be more than a tinkerer; you have to be something of an analyst besides. But tinkering helps. (chuckles) I think it helps. But you have to be an analyst; if you aren't an analyst, you can't really be a good engineer, in my opinion.

And so you felt you were an analyst, or did you conceptualize these ideas back in high school?

Well, I think that I learned to be an analyst. I didn't come by analysis as easily as some of the other fellows did, principally, I think because math was difficult for me. I had to work real hard in math.

Did you ever consider not going to school, or was it taken for granted you would?

I think it was taken for granted that I would, just like it seems to me that it is taken for granted that most kids that go to high school now will go on to school. I wasn't able to go on straight through school. I went to school for about a year and a half, and then the Depression caught up with us and I was out of school for four years, and then I came back at the end of

four years and finished. So, there was a hiatus in my schooling of four years that probably was real beneficial.

I was going to ask later how the Depression affected your family. Right after high school you went to the University of Washington in aeronautical engineering?

That's what I was planning; I didn't stay. They encouraged the students to get there a week or two early, you see. It was like a freshman week but it was different in that it wasn't organized like freshman week down here would be organized. And I didn't like it up there. You know, I was a small-town boy and I didn't like the thousands of people; and it was kind of cold and I was away from home and didn't know anybody up there. I didn't like it so I left.

This was the first time away from home?

Well, probably. No, not the first time away from home. But it was the first time in school away from home. My parents had encouraged me to go to some summer military training called CMTC, Citizen's Military Training Corps. This is one of the things that General McArthur was well known for, I guess. He was chief of staff [of the Army] and organized the CMTC. They would last for six weeks, as I recall, and after four years of six weeks each, each summer, you would be commissioned in the Army as a reserve officer—in the infantry, I guess it was. I only went for one or two summers but we were away from home. Basically, you were in the Army; you were living in tents and out running around through the hills on foot and so forth.

Where would you go?

Vancouver barracks. That's where I went.

Did you like it?

Yes, I enjoyed it. I didn't like it at first but I enjoyed it before I got through. It made a decision for me. It made a decision that I didn't want to be in the Army. (laughter)

You didn't like all those regulations?

Well, it wasn't the regulations; and the military life didn't bother me. I just decided I didn't like the Army; that I really would much rather be in the Navy. The CMTC helped me make that decision.

You made the decision early. You were telling me that the Depression caused your family to pull you out of school?

Yeah, I just ran out of money and there was no way in which I could go on back to school at the end of the... I guess fall term of my sophomore year was the last term that I was in school. And so I went home, and, gee, it was real hard to find anything to do. I tried washing windows but I

couldn't even find very many windows to wash because nobody could afford to pay you for it.

You went back to Pendleton?

Yes. I tried to get into the Naval Academy; tried twice to get into the Naval Academy. You had to take an examination and the guy that had the highest grade got the appointment and on down the line. I never was able to get the appointment. I got the first alternate on two different occasions (laughter) and Senator Steiwet offered me the appointment to the military academy at West Point but I didn't want to have anything to do with the Army so I turned that one down.

Because of your experiences during the summer in the CMTC?

Yeah. But I really did want to go to the Naval Academy but I was never able to.

What appealed to you about the Navy?

Oh, I don't know. It's hard to say. I didn't know anything about it which was maybe one good thing. But, you know, I was interested in ships and I was interested in things that they had done. I had studied some naval history as kind of an extracurricular activity that I was interested in—World War I naval history. I was something of an expert just on that alone. I don't know; I was just interested in the Navy. Still am. I'm still interested. I suspect that I always will be.

That's interesting. When you started at Oregon State College, can you remember your first impressions? You went as what? An eighteen-year-old or nineteen-year-old?

I was just barely eighteen. My birthday was in August, and I came here in September.

Can you remember your impressions of OSC and the School of Engineering when you first arrived?

Well, I had a number of friends that were in the freshman class. Charlie Rohrman was here and John Isaacs was here. John and I were roommates, as a matter of fact, for the fall term in the dormitory. And I had a number of friends. It was not so much like being away from home, I guess. You know, the University of Washington even in those days, in the 1930s, was a tremendous institution. And Oregon State was not. I don't think we had more than four thousand or five thousand students here in the whole University probably. So you knew what to expect.

Nothing was really a surprise to you?

Yes, I think that is generally true.

Who influenced you in the college here?

Oh, no one really. I came here because many of my friends were coming here. My friends basically went to one of two schools—Oregon or Oregon

State. And, you know if I was going to take engineering, I had to come to Oregon State; there was no way I could go to Oregon.

Had you decided at that time that you wanted to go into electrical engineering?

Not electrical, necessarily. I had decided that I wanted to take engineering, and originally I had planned to take aeronautical engineering, but somehow I got away from that. I can't remember how I did get away from that. I was real interested in aeronautical engineering when I was, oh, a senior in high school, but it didn't last.

It would seem that you would be interested in something to do with the Navy and water and ships?

It's just one of my basic inconsistencies.

Well, I think we all have those. Did you know Fred Merryfield at the time you started?

Yes. Well, Fred married a girl [Mildred Berkeley] who came from Pendleton, and she was a friend of my mother's, as a matter of fact. So I had known Fred as a high school student; you know, see him once in a while in the summertime when he would be up there visiting in Pendleton. He was teaching here at Oregon State at the time, but he and Mildred used to come up during the summer and once in a while we'd see them. Not consistently, not often perhaps, but we did see them. Fred and my father were fairly close friends; they were both civil engineers, and they had a lot of interests together and so forth. So I'd known Fred for a long, long time. Not intimately, but I knew him. I didn't have him as a teacher until, oh, a long time afterwards when I was taking hydraulics. As an underclassman, I didn't have him as a teacher.

He wasn't an advisor to you in those early years?

No.

Were you close friends with him then when you came here?

No, no. As a matter of fact, I think I went over there for dinner one time when I was a freshman, but I suspect, other than just occasionally on the campus, that was probably the only time that I saw them. No, we certainly weren't close friends or anything, but I did know them. I was a speaking acquaintance more than anything else, I guess.

Do you remember what you wanted to do with your degree in engineering when you were going to this school? What were your goals, in other words?

Well, I think probably they were not awfully well spelled out. Certainly the first couple of years was just sort of a confusing period. I don't really think I had a goal, a real hard, fast goal. I was still a youngster, and probably very immature. I'm sure I was. I joined a fraternity, and they tried to

make me grow up to some extent and were only partially successful, I would guess, while I was an underclassman.

Tried to make you grow up?

Oh, yes. I think that I probably was a real pain in the neck.

Why was that?

Well, you know, I was interested in things and not people.

You mean like tinkering?

Yes, that's right. And, you know, this is a sociological problem that you've got to get over some time, and so they were trying to encourage me to get over those.

Why did you join the fraternity then if you were somewhat anti-social?

Well, I wondered about that myself at one time. At the beginning of the second term I was really not very happy and pleased with what I had done, with the group that I was in, and so forth, and I think I probably would have departed if it hadn't of been for one upperclassman who also came from Pendleton. His parents were friends of my parents. His father was a doctor up there. Wilson McNary was his name, and he got ahold of me. He was a real sophisticated character. He didn't live in the house. He lived downtown. I think he lived at the hotel or some place. We had some sophisticated people around the campus in those days. He called me up, and he said he wanted me to have lunch with him one day so I had lunch with him. He reasoned with me and talked me out of breaking my pledge at least for another two or three months; and by the end of that time, I sort of grew up, I guess. And decided that I had some things that I had to learn. I'm very pleased that he convinced me that I was making a mistake because I would have been making a mistake. I wonder how many other youngsters have that same problem, you know, and no one happens to get ahold of them and get their thinking straightened out. I guess I'm inclined to think that it is more common than you might think, and sometimes it's overlooked. As a matter of fact, I hadn't thought of that for a long time until your line of questioning sort of led me into it.

You mean the influence of other people on your decisions?

Yes.

How did the Depression affect the goals and attitudes of engineering students at OSC?

Well, I think it made them much more objective. You know, I don't think that many of them, before the Depression, had hard and fast things that they wanted to do. I know I didn't. But after you have been out of school and had tried so hard to get in, and it was so hard to find anything to do, you made up your mind that when you got back in school you were there for a specific purpose and you were going to do the very best you could to

put yourself in a position so that you could compete when you did get out of school. And I think that most of the people that were out of school for a while and then came back had a maturity which gave them an advantage.

Then your leaving after your sophomore year influenced your thinking in this way when you went back?

I think if I had managed to go just straight through school for four years, I would not have come nearly as close to doing as many things in school as I did. I'm not saying that I did a lot of things, but I learned a lot more, I'm sure, as a result of being out of school for four years than I would have learned had I stayed in school and come straight through. As a matter of fact, I'm inclined to think that lots of people would be better off if, instead of going directly to the university right out of high school, they did something else for a year or two years and then got channeled. By that time they would know a lot more about what they wanted to do and they'd be more objective in their thinking and working and so forth. I don't know how you could arrange that but I think it's true.

I agree. It's certainly difficult to decide what you want to do the rest of your life at the age of eighteen.

You bet. That's right.

Did you retain your enthusiasm for electrical engineering when you left after being a sophomore?

Oh, Yeah. I tinkered, you know, at home with some of these things and did some studying; did quite a bit of studying, as a matter of fact. I acquired some books that I thought were valuable that I'd buy from the book manufacturers; I'd study them.

About what?

Oh, all kinds of electrical things: measurements and transients, you know, all the things that electrical engineers are interested in.

Did you know Holly Cornell and Jim Howland in those first two years? Had you met them yet?

No, no. I think Holly was out of school for a couple of years maybe, working in Portland after high school before he came down here. But I think Jim probably came directly to school right out of high school. Anyway, both of them were younger than I am. I think Holly was two years younger and Jim was four years younger than I was. But we were all in the same graduating class—1938.

Right. Were you optimistic or pessimistic when you left school about coming back? Did you expect to return after leaving as a sophomore?

Well, I hoped to. You know, things were so difficult that it was pretty hard to be optimistic. It was not at all easy to be optimistic in 1932.

I can imagine.

Unless you had the experience of trying to find anything to do, it's hard to imagine what that was like. You just couldn't find anything to do. You couldn't find windows to wash. Ultimately, I got a job one summer several years later working on a farm as a tractor driver. I got paid two dollars a day as a tractor driver. And the day started at sunup as soon as the grain was dry enough to harvest. That's when we started. We'd been out there for some time before it had gotten light, waiting for the time to start, and we kept on going until it got dark and enough moisture came down onto the grain so that you couldn't harvest anymore; and then we serviced all the equipment, and then we went back to the ranch and had dinner and went to bed. So it's a long, long day.

And then you got up the next morning?

And you got up the next morning and did it all over again. You did it seven days a week during the harvest season. It was a pretty good-size ranch that I worked on so harvest season ran for about six weeks.

And that's the entire job that you could find at the time?

That's all. And I was real happy to have that. You bet. I was lucky.

You couldn't help your father in some way?

Well, at that stage of the game, he didn't have anything to do either. He wasn't working part of the time. I can't remember all the chronology of what he had been doing, but there was a time there when I remember he was making wrought-iron furniture and trying to sell it. He and I had a little shop outside the house. There was just nothing to do. You know, what we're doing now isn't even close, doesn't even closely resemble that situation. It isn't even in the same ballpark. There was just absolutely nothing that you could find to do. It was real difficult and I was just over-joyed to have a job out there on that farm driving a truck part of the time and driving a tractor part of the time.

What other jobs did you have during that four-year period?

Well, I tried washing windows. I wasn't really very good at it; but I tried that. I cut lawns for a few people. And then a couple of years later I got a job with the Shell Oil Company driving a truck for them. They gave you a title, you were called a distributing salesman but, basically you were a truck driver. And I did that for a year or so and then I had an opportunity to go down to Portland and work for the General Land Office as a draftsman.

That was an appointment that I got through a friend of the family who was in Congress, Walter M. Pierce, who had been governor of Oregon prior to that time—Weeping Walter they used to call him. I don't know why he ever got that name, but I do remember that that's what they called him. Anyway, he was the one that was instrumental in getting the appointment to the General Land Office. And that was about a six-month stint, I guess.

But it was followed immediately afterward with another job working on—I'm not sure that I have the right name, but it was the Pacific Northwest Planning Commission I believe. It was the group that formulated the development of the Columbia River with the Bonneville Dam and the other dams, Grand Coulee, and so forth. Very interesting group of people that they pulled together, most of them college professors, some engineers; and I worked for them as a draftsman.

And after that experience, you still wanted to be an electrical engineer?

Oh, yes. One of the people that I worked for was a fellow by the name of Carey who later, for a short time, was Administrator for Bonneville; but basically he was an engineer, and he was head of the Engineering Department at Bonneville from the very first day that it opened. And Charlie Carey had a lot to do with the things that I wanted to do and so forth; only, I didn't know him until 1935, or something like that, when I started working for the Planning Commission in Portland. He was the head of the Electrical Department. I happened to work for him and he was a real interesting guy. At that time he was with Westinghouse.

So he encouraged you to pursue the electrical field of engineering?

Yes. And for a number of years after that, I worked for him. After I graduated from school, he got me a job as a junior engineer for the summer at Bonneville; I was only there for three or four months before I went to graduate school. Then he encouraged me to come out from Boston and spend the summer working for him on a special project between my two years in graduate school.

Oh, during the war I wanted to get into the Marine Corps and you have to get these letters from all these people—you know, recommendation and so forth. He was the one that refused to give me a letter of recommendation to the Marine Corps. He said that was the dumbest thing he'd ever heard of. He gave me a recommendation and a good one to the Navy but not to the Marine Corps. He said the Marine Corps didn't have any need for the things that I could do. It was really quite a letter; I should have saved it. I had letters from everybody else for the recommendations to the Marine Corps. I had to write to all of them to change the letters and give me letters to the Navy, because I couldn't get one from Charlie Carey and I needed one from him.

I'm surprised you'd want to go into the Marine Corps after previously saying that the Navy was an interest of yours.

Oh, that's true but there were a lot of things going on at the beginning of the war which sort of confused your thinking to some degree, I think.

How did it happen that you did start back to school?

Well, I had planned on going back as soon as I could and with the two jobs that I had in Portland working for the government, I was able to save enough money so that I could go back to school then.

How had the school changed from what it was when you were there four years earlier?

It hadn't changed a lot. Not really. The student body was smaller, I think. They lost some students, you know, as a result of the Depression. So I think the student body was smaller, it was just turning around and starting to enlarge again. I think the population of the student body was about five thousand when I came here in 1930. I suspect it dipped below that and then turned around and started in to grow again in 1936 when I came back.

How about the attitude of the engineering students in particular?

I don't think there was much difference. There was a lot of difference in my attitude.

In what ways?

Well, I'd grown up some. I'd matured quite a bit, as a matter of fact. And, so I had an entirely different attitude. But then, I wouldn't recommend to anyone the attitude that I had when I was a freshman.

And you met Holly Cornell and Jim Howland at that time? How did you meet them?

Well, Holly and Jim were in the class that I ended up in, graduated in 1938. Jim and Holly, I think, started the school in the fall of 1934 so they were freshmen in 1934-1935. And then they were sophomores 1935-1936, and I just joined their class, you see, at the beginning of 1936. They were both in civil engineering. I didn't know Holly as well as I had known Jim. Since I was a little older than most of the people, I used to do things more on my own. I didn't live in the fraternity. I lived close to it, and I ate some of my meals there, and I participated and so forth, but I had some serious things that I wanted to get done, and it wasn't easy to get everything done in the house because it was noisy.

You mean studies?

Yeah, and so I used to eat out and there was an eating place on Monroe and 26th, not far from the SPE house. Jim was a member of the SPE house, and he used to come over there and have a cup of coffee—maybe it wasn't coffee, I can't remember what it was that Jim had—and we'd sit down and talk. I had met him before and so forth. And I had done some surveying for Dad. I had a little surveying business, as a matter of fact—that was one of the ways that I had made some money to come back to school. And he [Jim] was interested in how you set something like that up, and how you get the jobs and so forth; and that's basically how we got together. We started talking about how sometime maybe we'd like to open an office. That was the beginnings of our association, talking about what the opportunities were and the problems and so forth.

It's unusual that an older student would fraternize with younger students.

Maybe I was older in years and younger in...

I didn't mean anything like that.

No, that may be true. You know, I enjoyed Jim. He was very clever. As a matter of fact, he had a lot of things that I don't have. He's a very artistic person. He's an artist. He could have been an artist. And, oh, the reports that he would write! I was very interested in the way he would put his [reports] together because they were done with a flair and with things that were different. And the ideas that he expressed were, I thought, unique and so forth. He was a very interesting person. He was probably not as much of a student as Holly but he was extremely clever in the way he presented things.

And that's one of the reasons why you were attracted to him?

I suppose.

How did you meet him? Did you say he was in the same fraternity?

No, different fraternity. He was in the Sigma Phi Epsilon and I was in Sigma Alpha Epsilon. We were up at the end of Monroe Street. And Sigma Phi Epsilon was right there on 26th. So we were in different houses. I think we met in class. I think we were in some classes together, probably in math classes, maybe in chemistry. I took physics when I was a freshman so it couldn't have been there. But, you know, we were in some classes together because some of the civils and the electricals fraternized to some extent in some of those classes in math, mechanics, chemistry, and things like that. That's probably where I got to know him. I don't remember other than that.

You mentioned that he talked about starting a firm of his own?

He was interested because I had had a little surveying operation before—guess I dropped that out a minute ago. But, after I quit working for the Shell Oil Company, before I came down to Portland to work for the government, I had this little surveying business. And he was interested in how you got started and how you got the work and things of this nature.

Well, tell me about that. How did you get started in the surveying business?

Through my father, basically. It was one of those things. I worked for the Shell Company for about a year, pretty close to a year. I can't remember why I started into the surveying business but it must have been because I thought there was a better opportunity there. Some of the work came to me because people were after my father to do some things for them. He was back working for the county at that time as a county engineer, I think. He didn't have any time to do the surveying so I did the surveying for him. That's how it got started. And I think I did that for probably about a year. I can't remember all the things that we did.

So it was through your initiative that you started this little firm of surveying?

Well, you know, there were certain, you know, opportunities come along of one kind or another and if they appeal to you, if you think that there is an opportunity there for you, you first have to take advantage of them, and do the best you can.

Why didn't you continue with your firm?

Well, after you had gone through the whole county and had measured all these areas, there wasn't anything more to do.

You couldn't extend into the next county?

No, I don't know how they did theirs. Umatilla County was the big wheat county. The other counties really you could put all the wheat they'd grow in your hind pocket probably. But Umatilla County was a major wheat producer in those days. With the advent of fertilizers and so forth, they've done a lot better now in some of the other counties; but in those days, they didn't do anything in the wheat area compared to Umatilla County and Walla Walla County in Washington. Some of those counties up there produced all the wheat; nobody else even tried to grow it.

So you had a taste of running your own business quite early then?

Yes, that's right, that's true.

Did it appeal to you when Jim Howland was talking about starting your own firm, or who was more enthusiastic about that idea?

Well, I think Jim was probably the more curious about it—you know, how does this work and how do you do it and so forth; and I had had a little experience; and so we just got to talking about it. We had a lot of things in common—curiosities and so forth. He was sort of a small-town boy, too—he came from Oregon City—and so we had some interests in those areas.

Did you have any idea, back in 1936, 1937, 1938, that a firm would result from your talks?

Well, I can't tell you when, but before we'd finished school; we had talked about the possibility of opening an office together. We didn't know where; we didn't know when; we didn't know what. You know, it takes an opportunity of some kind to put this thing together. That's one of the reasons, I suspect, why my father never did try to do this: the opportunity never appeared or he didn't see it if it did appear. And it's pretty obvious, you know, you have to have that opportunity or it isn't going to gel. So that's what we were wondering. When was the opportunity going to come? Where will it come? Are you smart enough to recognize it? And all those things.

At that time, Holly Cornell and Fred Merryfield weren't a part of these dreams?

No, no. As far as we were concerned, Jim and I had talked about putting it together. Jim and Holly may have talked about it some too. I am not absolutely sure of that. Actually the group, the four people, got together at a much later time.

Under what circumstances did you meet Holly Cornell?

Well, I never knew Holly as well as I knew Jim while I was in school. I knew of him and so forth, but he was not a close friend. Holly ran for student-body president, and I remember the SAEs were one of his strongest supporters. Jim was on the other side of the political fence; he was supporting another candidate. I guess that was when I was a junior. Holly lost the election. He didn't win the election, incidentally; he came reasonably close. But I guess I got to know him a little bit better in that campaign because there were a whole lot of egg fights and all kinds of battles that went on, on the campus, that spring that don't normally transpire on a university campus. We had more problems that we generated that spring than they've had in many instances since, I guess.

What do you mean?

Well, it was a very heated political campaign for all the student body offices. They had two parties: the orange party and the blue party. Holly was running for the orange party and just a very few of the fraternities were supporting the orange party; the independents and the rest of the fraternities were supporting the blue party. And then, like there always is, there were a bunch of votes that were not committed. And we had a big rotten-egg fight. There were rotten eggs all over Corvallis. There was a big hatchery out here at Hanson's.

Eleanor Hanson who was the oldest daughter, was going with one of the SAEs and Eleanor had a car. Her family was fairly influential and fairly wealthy. She had a car, and she and the boy she was going around with (chuckle) made trips all night long back out to the farm to get eggs that had been in the incubator but hadn't hatched out properly. And they were fearful; they were just terrible; but they were great to throw. Oh, boy! You know, the SAE were on the wrong side of the fence and everybody was coming after us but we defended things pretty well with those rotten eggs. I'll tell you! I don't know how many hundreds of them we threw. The whole town reeked with the odor of those rotten eggs. That's where they came from. Eleanor brought them from the farm. She had thousands to choose from. (Laughter)

So, Holly Cornell showed leadership qualities back then?

Oh, yes. You know, Holly had a flair for that sort of thing. He has always had a way of instilling confidence in people that he can get to listen to him. He still can. That's probably one of our real strong points, his ability to instill confidence in people. And he could do it then. I guess that's the reason why he was interested in being a politician, a campus politician

type. And I think that's been a real strong factor in our organization. He just instills confidence in the things we do.

How does he do it?

It's the way that he talks; the way that he conducts himself. I can't tell you how he does it; but people look at him and they say, "Gee, I have confidence in him." And it's always been true. He's calm and collected. You know, he doesn't get excited. That's just an attribute that he has.

It's hard to describe, I suppose, because I'm sure you don't get excited and are calm also.

Well, I'm not nearly as calm as he is. I do get excited and I get irritated and so forth, much more often than I should, and much more often than he does. Holly is a real stable influence, extremely stable influence.

Would you describe him as charismatic? As having the type of personality to whom people are instinctively attracted?

Yes, I think that's true. I think Jim has that attribute, too. But probably, you know, of the six principal people in the firm, Archie and Holly had it to the greater extent than anyone else.

More so than Jim Howland?

I think so. You know, I would guess that if you would look at them, that you'd say that Archie and Holly would have that charisma, in so far as attracting people were concerned, and having people have confidence in what you say and so forth, to a greater extent than the other four of us.

Fred, you know, tended to be a little bit flighty; not as consistent as you'd like and that would tend to destroy some of his efforts in that area. Ralph Roderick and Jim, they have this charisma too but it just seems to me that they didn't have that to quite the same extent that Holly and Archie would have it. I think, if you would put the people in a room, you'd find that Jim would know everybody in the room before he left; but he'd go to everybody. Holly probably wouldn't move very far but the people would all come to him. And Archie would be the same way; he would have a group around him. Jim is very much an extrovert and he'd go around and he'd meet everybody, you see, and he might have a crowd around him part of the time, too. But Holly would be the one that people would seem to gravitate to. And Archie Rice would be the same.

How would you fit in that room?

I guess I always would like to have been an extrovert but it's never been natural for me. It's not easy for me to meet people; I'm not really very comfortable a lot of the time when I meet people; it's a heck of an effort. You know, after I've been to a group where I've had to go out and meet a bunch of people, I'm exhausted afterwards because it hasn't been much fun and it hasn't been easy. I think it was easy for Ralph, and I think it was easy for Fred. I think it was probably harder for me than it would be

for any of the rest of them. It was a real effort as far as I was concerned. As far as Jim was concerned, it wasn't any effort at all. He is interested in people; he is out there. It used to irritate him terribly when Holly and I wouldn't know all of the people that were working here in the office. Jim would get just terribly upset because somebody would bring somebody's name up, and I wouldn't know who it was. And Holly wouldn't know who it was.

Did you care?

I didn't care. (Laughter) And Jim would get real upset about that. You really ought to know everybody in the firm, you know, and know all about them, know what their strengths and their weaknesses were. And that just wasn't something that I could get put together, I guess.

Back to Oregon State, did you ever meet with Holly and Jim and talk about his firm idea?

I don't think I ever met with Holly and talked about it. I don't think I ever knew Holly that well while we were in school. We were in class together, you know, but he was not one of the people that I was really awfully close to. He was in civil engineering; I was in electrical. That kept us apart as juniors and seniors, you see.

So there is nothing memorable about that school experience with Holly Cornell?

No, except his leadership of the orange party, trying to become student-body president.

Who did he lose out to?

Bob Henderson, who is up in the Agriculture Department up here. He is retired now, I think. But, as I recall, Bob Henderson was an independent, and he won the election. Interestingly enough from a political standpoint, when the class that we were in, 1938, became seniors, Jim Howland was the class president. When we were a junior, a fellow that lives over in Hawaii and has never been associated with the firm, by the name of Meredith Huggins, was president. When the class was sophomores, Holly Cornell was president. And when the class was a freshman, and this is while I was out of school on my surveying stint and so forth, the fellow who had been elected class president flunked out of school and my wife, who was the vice president, became the class president.

My gosh.

(Laughter) So we have had absolutely fantastic success with class reunions. And the reason is, you see, because out of three of the four years, somebody reasonably close to the firm, either Jim or Holly or my wife, have been close enough so that they know all these people. They can get them all to come back. So the class of 1938 always has these great big reunions; hardly any other class can compete with them as far

as numbers that far away. The class of 1975 might do better than the class of 1938 but then there were a lot more of them and they have more in common with each other. But when they've been out of school for forty years, maybe they won't have as much luck.

It is curious that during that period of years so many of the presidents were associated with engineering and not some other disciplines.

I don't remember what—I think Meredith was probably in business administration or something when he was a junior.

I want to ask about your wife. What was she majoring in?

Home economics. Marketing, that's what her interest was.

What were her goals in marketing?

Well, she had a scholarship to New York University in marketing. She never took it up. We got married during the summer. Jim and I were going to be roommates at MIT, and he had to find another roommate because I ditched him for a better one (chuckles).

It sounds like it.

So she didn't take up her scholarship; she taught while I was in school back East.

How did you meet her?

Oh, she belonged to a sorority, Pi Beta Phi, and they lived just catty-corner from the SAE house and I used to see her quite often; you know, walking to school and on the way back and forth to school. She was a very attractive girl, and I was immediately attracted to her along with a whole lot of other people. She was a very popular coed.

What was her maiden name?

Reynolds. She is a cousin of Earl Reynolds who is Chairman of the Board. (laughter) We're all interrelated here; it's kind of a family affair.

That's just coincidental?

That's coincidental, yes. Just after Billie and I were married in 1938, I was going back East to go to school, and she was going back East to work and put me through school. We stopped in Klamath Falls where Earl Senior lived, and where Earl, Junior, and his sister lived on a farm out of Klamath Falls. I believe that was the first time I'd ever seen Earl. He was like a high schooler, you see, at that time; and he was bug-eyed (chuckles) by somebody in the family going back East to school and so forth. It was a great family. His father is a great person. He's still living: Earl Senior.

Was he an engineer as well?

No. No. He was always in chamber of commerce work. But he worked for my father at one time in LaGrande. My father used to be city manager in LaGrande. That's why we were there. And Earl Senior worked for him, you

know, in and out of school and so forth. I think he was a paving inspector as a matter of fact. They were paving a bunch of streets. And, you know, I used to play with some cousins that lived in LaGrande.

Cousins of whom?

Billie's. Their name was Reynolds—Charlie Reynolds. Charlie Reynolds at one time was the chairman of the State Highway Commission, and he always lived in LaGrande; he never left there. He lived only about a half a block from where we lived when we first went there, so I played with those kids. They were a little younger than I was but I played with them. So the Reynolds name, you know, was something that was just almost like family then I guess.

However, you had never met your wife before you went to college?

No. I'd never met her because, you see, Ralph was the oldest brother and he left [LaGrande] before Billie was born. She was born in Wyoming. He was a county agent type in Wyoming, and then he was in Denver in agricultural work, and then he left there and came to Portland. I had never met her until I came here to school the second time. She is four years younger than I am. We didn't go out; I didn't go out with anybody. I spent all my time working. I didn't have any extracurricular activities of any kind, shape, or form.

Studying or working?

Studying. I'd work in the summer and I could make enough with my surveying business and so forth to keep me going for all year. But I didn't go out; you know, my social contacts were just practically nil. I don't think I ever went out with Billie until, oh, the middle of our senior year probably. As a sophomore and a junior, I spent all my time working.

You were determined to succeed.

I'd had too much trouble getting back in school to fool around.

Trouble? You mean financial trouble or academic trouble?

Too much trouble putting money together to get back to school.

You were highly motivated to get an education.

You bet.

It never occurred to you not to get that education, to maybe work for your father?

Well, you know, I had never given up the hope that I would finish school. And [my father] never even considered that as a possibility. It wasn't a question of yes or no, it was a question of when. With someone having that kind of confidence that things are going to work out, they usually work out. But it wasn't easy. And because it wasn't easy, I had my nose to the grindstone when I came back to school. And I enjoyed every minute of it.

Was that pretty typical of students...?

Oh, a lot of people did that. You bet. I tell you, the Depression aged a lot of people.

What do you mean by aged a lot of people?

Oh, you matured in just short order during the Depression because of the problems that you had. This recession that we've had up to now—people try to compare it—it's not even close.

You are talking about problems of survival?

Yeah. Just getting something to eat and some place to live. It was disastrous. The banks were all closed; all of them; not one of them, all of them. You couldn't cash a check for thirty or sixty days; I don't remember how long it was. You just can't imagine the desperate feeling that people had at that time. You know, it is a disaster now, but this isn't even in the same ballpark with that. So, boy, everybody matured in a hurry. After you got out of high school, why you matured right now.

You felt you might not have enough to eat unless you worked hard?

Well, I guess I never was really terribly concerned about starving, you know. But all of the other things that I wanted to do were so difficult to achieve. So, you just matured. And when you had the opportunity to go to school, you hit the ball.

Yes, I'm sure a person would work harder under those circumstances. Did you ever get together with Fred Merryfield and Jim Howland and talk about firms?

No, not that I remember. Jim might have but I don't remember that I did.

So, it was really just in passing conversation that you and Jim Howland talked about the firm idea? It was really just a long distance dream?

Well, you know, I can remember sitting at the restaurant up here on Monroe and 26th Street. It was called Eiler's Cafe. I used to have breakfast in there quite often and once in a while I'd have lunch or dinner if I wasn't going up to the House. And I remember sitting down with Jim at the counter and we would talk about these things, I think probably fairly consistently and fairly often probably. I can't specifically remember what we talked about and so forth but I have that feeling that we did that fairly consistently. But I don't remember talking to Fred or Holly about it at all, though Jim may have. I suspect if you asked each of the four, they'd all remember differently. But as I remember it, Jim and I had talked about doing this even when we were back East. We were both graduate students at MIT at the same time, and we talked about it then. I used to see Jim frequently; he was always coming up to the apartment for an onion. Sandwich. (Laughter)

An onion sandwich?

Yeah, he liked onion sandwiches and Billie was a great one to make onion sandwiches and he used to bring down the girl that he was going with whom he later married. But even in those days, we were talking about this same sort of development, putting something together some time. But we didn't know when and we didn't know where and we didn't know what. I think during the war, Jim was out in the Pacific. He got home for leave sometime I suspect around 1944; it was before, oh, a year or so before the war was over. Fred had been in the Army and had been mustered out because he had been in New Guinea and had gotten so terribly ill down there. So he was back in Corvallis. Jim lived in Oregon City and, while he was on leave, he came down here. He talked to Fred about setting up—what the problems were and how he would view it and so forth. And as I recall it, Fred said, "Gee, Holly and I have been talking about doing the same thing. Why don't you and Burke come and join us?" As I recall, that was about the first that I knew of the potential of the four of us getting together. I was in the Navy on the East coast, and, as I remember, Jim wrote to me and told me about his conversation.

There are some letters in the archives. Did you know that? Letters between Holly Cornell and Jim Howland about you and setting up this firm?

Those probably were written in the fall of 1945.

Right. And in December.

This was before that. This was while the war was still going on and Fred had been mustered out of the Army and Jim was home on leave. I don't know where Holly was, probably back on the East Coast. Holly was in the European Theater. I don't think he went overseas until 1944 and so maybe he was just going overseas. Jim had been out of the country. Jim was supposed to go to the Philippines; the only reason he didn't go to the Philippines was because the Japanese beat him there, so he was out of the country just almost from the first day. He was in Hawaii for a long time, and then he was on Saipan; so he was gone all during the war. I was on the East Coast most of the time and I think Holly was on the East Coast most of the time. But Jim was out of the country.

FRED MERRYFIELD, MIT, AND MILITARY CAREER

Before we get to that part of it, let's finish up at OSC. What kind of a teacher was Fred Merryfield?

Excellent. One of the best.



Fred Merryfield, 1948

Tell me about him.

If I had to name five teachers that were the best teachers that I've ever had, he'd be one of the five. Willard Geer, the high school physicist, would be one of the five. Fred was a fantastic teacher.

In what ways was he a fantastic teacher?

Oh. He had a way of leading. He had a way of scaring you into doing things that you might not otherwise do. He had a way of making you work hard. He held a very high standard, extremely high standard. But I guess one

of the best things that he did, and one of the great failures I think that most teachers had, was his ability to correct a paper with notes and comments and so forth and get it back to you and say, "I want it back with these things fixed," I kept them, the papers. A friend of mine, as a graduation present when I finished school, had bound all of the reports and papers and things that I wrote while I was a student at Oregon State.

A friend of yours from school?

Well, no, not in school. He was a fellow that I had met that was a very close friend of mine. He was older than I was by about five or six years, and as a graduation present he had all these papers put together and bound. I still have them. And some of them are the reports and problems and so forth we turned in in hydraulics, and the notable part of those is not the stuff that I put together but it's the comments and the corrections of Fred Merryfield and Charlie Mockmore, who was head of the Civil Engineering Department and also taught hydraulics, the things that they'd put on there.

It's a heck of a job for the teachers to do that and not much fun. It takes a lot of time. It probably takes them more time to do that as it took the original guy to write it. But you know, that's where the teaching is done. If you don't make a mistake, you may not learn very much. You really learn through the mistakes that you make, and Fred and Charlie capitalized on that. They did a fantastic job. You just can't believe the detail that went into the corrections of those things. It's a work of art. It really is.

Fred Merryfield enjoyed doing it obviously and interrelating with his students?

Well, I'm sure he did. It was hard on him; I don't know how many hours he spent doing this, but a lot. But he was a fantastic teacher. There were things that he did that I thought were just great. At the beginning of the

term, he'd give you a list of problems that you had to finish by the end of the term. He didn't care whether you finished them in the first week or the last week, but you had to get them all finished. He just left it up to you to schedule how you were going to do them. If you let them go until the last minute, you were in trouble, and he didn't have much sympathy.

Was the class mostly projects and no lectures?

No, they had lectures. Some of his lectures would go for hours. If you were starting an experiment in a class with three-hour laboratories and you were starting an experiment, he might use a three-hour laboratory as a lecture period talking about how you were going to put this thing together, you see.

And he kept everybody's interest?

Well, he'd scare the geewaddens out of you. He'd throw erasers at people that were not paying attention. Or sometimes, if someone wasn't paying attention, right in the middle of a discussion he'd invite them to come up to the board and finish the derivation that he'd started or something. When you stood outside the door of a room where Fred Merryfield was lecturing, as the students would file out, you could hear them go, ahhhhhhhhhhh [big sigh of relief]. (Laughter)

A big sigh.

Oh, yes, because it was just like being in a boiler, you know.

You liked that?

Well, I don't know that you liked it at the time, but when you got through, you look back on that as an experience almost without parallel. Because the leadership was there, the information was there and you really knew why these things happened. Very often, you know, you learn by rote; with these people you learn by reason. They were great teachers, they really were.

They team taught?

Yes. Charlie Mockmore was head of the department and Fred was a professor of civil engineering. Charlie could have had an office all to himself, but he didn't. He and Fred shared an office, and they did a lot of work back and forth together. Charlie was an interesting person. He had gone to school at the University of Iowa or Iowa State, I don't remember which one. He was an all-American football player from back there or an honorable mention I guess— lineman— and a big strapping, strong guy but, you know, real capable; and very much interested in his students. He just had a tremendous interest in his students; and Fred did too.

Were you singled out by these two gentlemen as an exceptional student?

No, I don't think so. No, I'm sure that every paper that was handed in, unless there wasn't anything wrong with it, had the same type of

comments. The comments would be different because comments on my paper wouldn't fit somebody else's.

So at the time, would it have been rather a disconcerting thought to think that you might go into business with this fellow that frightened you in the classroom?

Well, he didn't frighten me anymore. But he...you know, I think if you went to all the students in civil engineering—he didn't teach many mechanicals or electricals—but if you went to all the students in civil engineering that had graduated from this school from 1930 on up to 1950, and maybe 1960, and just asked them one question, "Who is the outstanding professor in civil engineering in your opinion?", I'll bet you, that more than fifty percent of them would tell you that Fred Merryfield was. I think that's true.

He was a fantastic leader. Interesting guy. I don't know if you've heard these stories about him or not. Fred was an Englishman. He came from a relatively poor family. His father was a labor leader in England. I think they lived in Liverpool or Manchester—one of those cities in western England. Fred didn't have many opportunities but he was very, very capable and, as a result, because of the English system, he got an appointment to one of these very nice English grammar schools.

That's where his education started. And, because he was associated with the grammar school and went on through school, when World War I came along, Fred had an opportunity to get into the Royal Flying Corps which became the Royal Air Force. Fred was a fighter pilot in World War I. The last time he ever flew I think was 1917. Now he was only seventeen years old, you see, at this stage of the game. He was born in 1900. He crashed and he fractured his skull, and broke both arms and legs and his jaw and popped the eyes out of the sockets. He was a wreck; just nearly dead; they thought he was dead. As a matter of fact, they sent a... don't know what you call it—but to pick up the bodies and bring them...



Fred Merryfield, the
WWI RAF Fighter Pilot

A stretcher? An ambulance?

No, it was an automobile—an old Model T Ford. It wasn't an ambulance but it, well; it might have doubled as an ambulance. They drove the ambulance over an abandoned railroad grade, over the top of it, and when he [the driver] went over the top of it the back end flipped up, and Fred's body flipped out. When they got to where they were going they were missing one; so they told this driver to go back and get this guy and they went back there...

They didn't know he was alive at the time?

They thought he was dead. They went back and got him and he had moved some; so then they knew he was alive. They sent him to a hospital in England and he was there for a long, long time. By 1919, after the war was over, they sent him to Canada to recuperate. He could see but was blind in one eye. Still he had gotten his arms and legs put back together and a silver plate in his head and all this stuff. He decided that he wanted to visit a buddy, a Royal Flying Corps buddy that lived in one of the English-protected islands down in the South Pacific, and he was headed there when he got off the train over here in Albany to get something to eat, and the train went off and left him. (Laughter)

And that's how he got here.

Oh, come on.

That's a fact.

I don't understand how he ended up at the college?

It was about 1920 or there, you see. That's how he ended up in Albany and Corvallis. Everything was on the train; it went off. But Fred was used to doing without anything. He lived in a tent down here for one year, down near the Willamette River, while he was in school. Lived in a tent.

What a resourceful person he must have been!

Yes, he really was. He was a great guy. And he graduated about 1923 or 1924 and went to work for the Southern Pacific. They were building the railroad from Oakridge over the Cascades and down to Klamath Falls. Fred went to work for them, I think, as a level man at first. But immediately they recognized the tremendous drive that the guy had and so forth and so he was sort of taken under the wing of the chief locating engineer for the Southern Pacific. His name was Charlie Berkeley. And one summer while they were working, his niece from Pendleton, Mildred Berkeley, came down to visit for a while; beautiful country up there, you know, in the Cascades. And that's how Fred got to know Mildred. Fred was Charlie Berkeley's number-one man and Mildred was his niece and that's how they met. And then after he finished working for the Southern Pacific, he came back here and started teaching in civil engineering.

He didn't have a master's then?

No. I don't think Fred ever got a master's. I may be wrong but I don't think he did.

Then education doesn't necessarily make you a good teacher?

No. I think that is very true. I think the relationship between teaching and higher degrees is just a chance. Some of my finest teachers were people with advanced degrees; some of them were people that had bachelor's degrees. All of them knew more than I could learn from them. Fred had

many people working for him who were working on advanced degrees and who didn't know as much about the subject as he did.

Really, his only experience then was with the Southern Pacific?

Yes. Before we opened this office I think that... well, the summertime... that's not true. In the summertime he worked for various offices: the Corps of Engineers, various consultants, Stevens & Koon for one, and a number of other firms. He did a lot of work outside, but as far as working for anyone twelve months out of the year... Southern Pacific, then Oregon State University—no. Then, as the war was getting started and they were building these cantonments at Camp Adair, he worked for a consulting engineer who was designing Camp Adair; then he was in the 6th Army down in New Guinea, then back to Oregon State, and then part-time Oregon State and CH2M—I think that is basically a thumbnail sketch of Fred's work experience.

And he was blind in one eye?

Well, he recovered the sight of the other eye up in Pendleton, he told me. He said they were riding down the highway in the mountains one day and he said to Mildred, "Mildred, I can see." The sight of the other eye came back like that. Fred never wore glasses; he had fantastic long-range vision. He couldn't see anything close up; I can't either anymore. But he never did wear glasses, you know, at a distance. Very keen vision.

Was he a religious man at all? I mean the fact that he recovered his eye sight so miraculously...

Oh, not unduly. Fred was a great supporter of the Episcopal Church here, but, you know, not unduly.

I wouldn't think such a speedy recovery happens very often.

No. well, you see, it was 1917 when he lost the sight of that eye and it was probably nine years later when he recovered it. It was after he and Mildred were married. And I would guess he'd been here for a year or two teaching.

Did Fred Merryfield ever talk to you about why he chose to study engineering?

No. I haven't any idea why he chose engineering as a field. He had not had any prior experience I'm sure because, you see, he had been in a grammar school in England. Fred came from a fairly poor family in England and he had a scholarship, I guess you'd call it a scholarship, to this grammar school. He finished the grammar school, and then he was seventeen and went into the British Army, and then ended up in the British Royal Air Force, or Royal Flying Corps they called it then. And so after the war, and after he'd recovered from his injuries, he started right into college. Now why he went into engineering, I haven't any idea. He had not had any prior experience, I'm sure of that.

Maybe some of the others will know.

I have a feeling that I probably know as much about Fred's background as anyone you can find, because I think I spent more time with him than anyone else.

Why is that?

Oh, part of it, I think, was because Fred was very loquacious, and I think I had more patience in listening than most of the others. I really think that's probably true. Fred loved to talk and after a while sometimes it would get a little boring, unless the subject was something you were interested in. Now I was real interested in his stories about the construction of the Southern Pacific Railroad from Oakridge to Klamath Falls; that's what he worked on when he first got out of school. I was real interested in that and I don't really think anybody else really cared. I was always interested in the railroads, the history of the railroads—how they were built, who put them together, all the problems that they had and so forth. I was almost mesmerized by Fred's stories. I thought they were very interesting but I don't think anybody else thought they were interesting.

Was that a major topic that he talked about?

Oh, he loved that.

He loved to talk about railroads with you?

Yeah, at the slightest provocation. As a matter of fact, at one time, he and Mildred took Jim and Meisy and their kids, and Billie—no, Billie was sick and couldn't go—and our youngsters and me on a train trip from Albany during the daylight, up over the pass and to Klamath Falls; and then we got off the train and picked up the northbound train that came in an hour and a half later, and we took the same train back to Albany again. And he pointed out all these things, you know. I thought it was a fantastic trip. Probably nobody else even remembers it, but to me it was really a highlight of a long time.

Have you done much work with railroads?

I worked for them for a while, Yeah.

For the firm?

No. When I had this little surveying office, we did some work for the Union Pacific Railroad. And, you know, [there is] something about a railroad; if it gets into your blood, you've got a problem. Well, it got into my blood. It got into Fred's blood, obviously.

You weren't able to make railroads a more important part of your life?

Well, I'm sure Fred thought of that and he had an opportunity. I didn't ever have that kind of an opportunity, though I had some [opportunity], except when you get realistic about it, as far as I was concerned, there were some limitations in a railroad career that I didn't really care for.

Like what? What do you mean?

Well, you know. It's slow climbing the ladder, a plodding type of thing. You start out as a draftsman and spend so many years doing that. The railroads are... I think for most people, to see a train roll by is something that you can't help but be fascinated by.

I know from talking with the other people, you know more about Merryfield's past than they do.

I'm sure that's right, and I was interested. I think Billie was bored. You know, he and Mildred would come up at seven o'clock in the evening and they'd leave at 12:30 p.m. and Fred would talk almost all that time.

Oh, that would be hard for a lot of people to tolerate.

That's right.

But you enjoyed it?

And I think Jim just didn't encourage them to come. He had other things that were more important to him. I enjoyed talking to Fred. I enjoyed hearing his stories.

Would he listen to you others at all?

Oh, Fred was a funny individual. Billie's grandfather had been president of the university here, W. J. Kerr. Fred didn't like him. He didn't like him because W. J. was the principal individual on the campus. He was like the general in the army. You didn't ask any questions; you just did what he said. He was going to pick his successor; he was going to do this and he was going to do that. Fred had other ideas about who his successor should be. One of them was H. S. Rogers, who was dean of engineering and who later became president of Brooklyn Polytechnic Institute. A very able man. A very able man—very fine engineer and a very able administrator. And I guess I'm inclined to think the University here would have been far better off if H. S. Rogers had become president of Oregon State after W. J. Kerr became chancellor.

They didn't have a president for a short time and then Peavy came into the office.

That's right. They had interim presidents and so forth. I don't know all of those reasons, but anyway, Rogers lost interest in short order. He was a builder, you know, and he sort of said, "Gee, if you are going to screw around like that, why, I'm going someplace else." And he went back East and the first thing you know, why, he is president of Brooklyn Polytechnic Institute—a major technical institution in the United States. He was on the board of directors of several banks back in New York and was really quite a guy. Oregon State lost; they lost terribly. Fred was right; I don't think there's any question about that. But that used to irritate Billie because Fred would just say, you know, "W. J. just made a mistake." (laughter) And that was kind of hard for Billie to take.

Did he enjoy rubbing people the wrong way?

I don't know whether he did or not. I'm not sure that he enjoyed—sometimes I think he did. Yeah. That's probably true. But very often when he was rubbing someone the wrong way, he was doing it for some kind of a purpose. He used to rub his students the wrong way—very often. He just beat the geewaddens out of them. You know, driving. He was a tremendous driver.

When you talk about him in that way, I don't understand how you three students could want to work with him.

Well, I think you have to realize that he had tremendous strengths and tremendous weaknesses. You know, if we could play up his strengths and cover up his weaknesses, why we had something going. He knew a lot of people. And there were a lot of people in this small public arena who were unhappy with the services that they'd been getting because people hadn't been doing a very good job for them. And Fred's feeling was they deserve better and they can get better.

He was popular then with people other than the students?

Yeah. With many people he was popular.

Even though he talked quite a bit?

Well, I don't really think he talked like that to everyone. Fred had many faces. He could get up in a group and give a dissertation on a subject, and make a presentation in which he was really not very well prepared, and do a tremendous job. He was a good speaker; he had lots of presence, good sense of humor; you know, pulled everybody into the discussion and so forth. But getting in a small group, he very often tended to be a little overbearing. I accepted it because I had tremendous respect for him. Not everybody would.

It is interesting that you have hung a photo of him on your wall. It is really the only one that's not of a family member.

I think that probably more than any other person, that he is responsible for this place. Fundamentally, he is responsible for it. He's not responsible for its growth, but he sure is responsible for its formation. Jim and I were groping, you know, for a way to get this thing put together. Fred was the one that says, "Follow me", and we did.

He wasn't involved in the operation of the firm after it was started?

Well, Fred had certain things that he was responsible for. He acted as a consultant. If you had a pump problem, you couldn't go to anyone that knew more about it than Fred. But the big contribution that he made after that was in the staff area because he did have this ability to evaluate people.

Why did he choose Holly Cornell to be a partner with him rather than some other student?

Holly was probably one of the best students Fred ever had. I would guess that if you were going to rank the two best students he ever had, that one of them would be a fellow by the name of Jack Graham and the other would be Holly Cornell; and I don't know which one would be high and which would be lower. Jack retired as a major general in the Corps of Engineers here a couple of years ago; really a fantastic person. And Holly... I don't think Fred ever had anyone that could compete with those two as students.

Do you think it was because of this very exceptional student, Holly Cornell, came along that Fred Merryfield started to think of forming his own firm with Cornell as a partner?

Well, I don't know. I think there's a lot of truth to that but now we're talking about something that I'd have to speculate about.

Oh, I thought he might have said something about this.

No. But I do know, that he felt that Holly and Jack Graham were two of the finest students that he ever had. I think Jack and Holly were not too far apart in age but Jack went straight through school, and Holly didn't start until he'd been out of school for a couple of years. I think Jack finished in 1936 and Holly in 1938.

You mentioned that you knew Fred Merryfield through your father, but did you socialize with him at all during these school years here in Corvallis?

No. I think I had dinner over there once. As a matter of fact, John Isaacs whom I have referred to before, was related to Mildred Merryfield. John came from Pendleton. His father had worked for the Southern Pacific and his grandfather was the chief engineer for the Southern Pacific way back when the Southern Pacific was put together.

The Isaac name in the Southern Pacific annals is reasonably well known. John's father died in a hunting accident when John was just a small boy, and I think his mother probably went back to Pendleton to live because that's where she came from. She was related to Mildred, and so when we came down here to school, and John and I were roommates, you see, why it seems to me that John and I had dinner over at the Merryfield's one night that fall term. And I think I was a guest of theirs at dinner one time three or four years later when I was here in school. Other than that, and other than see him on the campus, you know, I don't think... We weren't intimate or anything like that.

I see. It was pretty much a student/professor relationship then. Now, when you graduated in 1938, what were your plans?

Graduate school.

You wanted to go to graduate school? You didn't want to work first?

No. There were certain things that I was real interested in doing in graduate school. You asked me about teachers. One of the great teachers that I had was in electrical engineering; his name was Starr—Eugene.

This was at MIT?

No, here. He was in electrical engineering; now he is a consulting engineer for Bonneville. And Gene was a fantastic teacher. His teaching techniques were entirely different from Fred's. He hated to grade reports. As a matter of fact, I used to grade his reports for him, and I graded his examinations for him as a junior and a senior.

Gene had a different technique: he didn't lean on the grading of the reports as much as Fred did, but he had a fantastic way of making a presentation in class. You know, I always thought Bonneville was real fortunate to get him, but in reality I look on that as a disaster because the school lost a tremendous teacher that they never were able to replace. They've never had anyone in the electrical [Engineering] department that even come close to him—before or since.

So he was a big influence in your life?

Oh, yes. Gene Starr is one of the outstanding engineers in the United States. He belongs to the National Academy of Engineers and he's extremely well known and very, very competent and an excellent teacher. I think he had a master's degree.

He must have thought highly of you to have you grading his papers?

(laughter) Well, I've often wondered about that, you know. He'd give me all his reports and all his final examinations to grade; and then I'd bring them back to him and he'd look at mine, and if he agreed with what I'd done with mine, he wouldn't pay any attention to the others. And I always thought, gee, that would worry me if I were him, but that was the situation.

You mean you graded your own paper?

Graded my own paper, yes.

Well, that must have been hard on you?

No, not really. Not if you're objective.

Well, how could you be objective about your own test?

You know, if it's wrong, it's wrong. And if it's right, it's right. For two years I graded all six terms. I got paid for it. I didn't do it for nothing; he arranged for me to get paid for it, I don't remember what it was. Really a heck of a job. Those damned reports take a long time to read and grade, and I never graded them the same way that Fred graded his. But Gene didn't... he'd glance at a few of them but that was not his technique for teaching.

What did he think you should do? Did he have any suggestions or push you towards a certain direction?

No, I don't think so. He encouraged me, whether he knew it or not, to get into what we call power system analysis. That was what I was interested in, and I think I was interested in it because of his leadership, really. I don't think that Gene really pushed me in any specific direction any more than he pushed anybody else.

He's still an active man; he's a consultant for the Bonneville Power Administration. When I go to a meeting where he is, or a group where he is, and he introduces me to someone, he introduces me as one of his boys; and he always has. He has introduced many of his other former students that were reasonably outstanding in the same way—one of his boys. As far as he is concerned, it's a fraternity. Now, I don't think he pushed anyone of those people that I know of in any one direction. If they asked for help, he'd give it. He probably never volunteered it.

So you were one of his outstanding students?

Well, I don't know if I was outstanding but he does introduce me as one of his boys. I appreciate that because I think it's a pretty nice fraternity to belong to. (chuckles) I say he encouraged me, whether he knew it or not, to get into what we call power system analysis. I had such tremendous respect for him and interest in what he was doing that, I guess, to some extent, I tried to emulate what he was doing. That's probably the biggest single reason why I got into power system analysis when I went to MIT for graduate work.

Does he know that?

I'm not sure he does. I don't know why he would know it, as a matter-of-fact.

I bet he'd like to hear that.

(Chuckles) Tremendous teacher. Somebody came to me the other day here in the office. They were looking for a speaker at a rather sizable meeting on a given subject that they were putting together this next spring, on a given subject and they wanted to know if I could think of somebody who's a good wrap-up speaker. "Boy, you know, you've got to start right out with Starr. He's seventy-eight or seventy-nine.

Tremendously dynamic person still and a tremendous speaker. A great lecturer."

What a gift.

Yeah. He and Fred were the greatest lecturers I ever ran into. I have a string of teachers that I think are great and they are part of them. But they were the lecturers.

I've heard you mention three. The one in high school, and then Fred Merryfield and...

Geer in high school, Fred Merryfield here, and Gene Starr here. Fitzgerald and Carl Wilds.

Are they from MIT?

They were from MIT.

You didn't say anything about them?

Probably not. But they've got to stand out; they've got to be amongst the five.

And then Ralph Booth was the man you admired the most?

Ralph Booth was not a teacher. He was a practicing engineer who was a fantastic person. But he was not teaching.

But these two professors at MIT had an influence on the direction you took as well as the other three?

Oh, yeah. Fitzgerald probably more than Wilds.

What did he teach, or what was his specialty?

He was a professor of electrical engineering and he was teaching power system analysis. And so was Wilds. Wilds were teaching power system analysis. They were both in the electrical engineering department. Wilds had been a mathematician and had transferred into the electrical department. Gene Fitzgerald had always been in power system analysis. Gene was probably a year or two younger than I was but he'd gotten his doctorate at Brooklyn Polytechnic Institute and was teaching at MIT. He was a real close friend of mine even when I was in school and a student. He was not married at that time, and he was up at the apartment and had dinner with us, and we went on trips together around through New England, and so forth. And then he used to work for Jackson and Morland during the summertime. As a matter of fact, he always had the desk right next to mine, and we worked closely together. Fantastic person. But not a great lecturer. He was a tremendous teacher but in a different way. Starr is a spellbinder. You don't see them very often. I always have thought that it was unfortunate that he left Oregon State and went into consulting because he was such a tremendous teacher. You don't really find very many like that.

Did you know Archie Rice when you were at OSC?

No. He was behind me in school.

He was a freshman when you graduated?

I think so, yes.

Why didn't you and Jim Howland and Holly Cornell start your firm in 1938, when you graduated?

Well, I didn't know that Holly was interested, and I don't know whether Jim knew that Holly was interested or not. We had all decided that we

were going to take graduate work; I think we had all decided that we needed additional training. Jim had hoped he had a scholarship to Harvard in soil mechanics; it turned out to be at MIT, and I think that has always been something of a disappointment to Jim. Holly had a teaching fellowship or something like that in structures at Yale, and I had a sort of a GE scholarship in electrical engineering at MIT.

You must have all been very exceptional students to get these scholarships?

Well, yeah, I guess... they [Jim and Holly] were more exceptional, I think, than I was. I really didn't have a very good record when I was a freshman. I told you I was pretty immature when I was a freshman here, and I didn't work very hard, and I didn't do very much. I had a good record the last three years in school.

My first year in school was just real average. I just barely made my fraternity grades, you know; 2.5 or something like that was what I was rocking on. I didn't fail any classes, I just didn't do very well in most of them. While I was a sophomore, junior and senior I did a lot better. But I think Holly and Jim had had exceptional records. Both of them had better records than I had. I am not disappointed or ashamed of mine but theirs was really exceptional. And as I told you the other day, I think it's true that Fred always assumed that Holly was one of the best students he'd ever had so that speaks pretty well for his scholastic ability.

Had your goals changed between the times you were an undergraduate and the time you were a graduate? Did you still want to pursue electrical engineering?

Well, as an undergraduate, after I had been in school for one year and out for four, I'd pretty well made up my mind that I wanted to be an electrical engineer. I'd picked up a number of texts and was doing some studying outside of working hours and in the evening and so forth in the electrical field, so there wasn't any question in my mind at that time about what it was I wanted to do. And that's why I made the application to do graduate work at MIT in electrical engineering and in the area of power system analysis. That's what I was interested in.

Who kept alive the idea of starting the firm? Or was it dropped?

I don't think it was ever dropped. You know, it had to have the right environment, it had to have the right time and opportunities and I think Jim and I both understood that until that opportunity and time came along, that all we could do was to hope, and that's what we did.

If it hadn't have been for Jim Howland, do you think you would have continued to pursue the idea of starting your own firm?

That's hard to say; that's awfully hard to say. You see, the time that we started the firm came at a break in our lives because the war was over. Each of us had been in the service for three or four years and any connection that we'd had with things that we'd done in the past—jobs that

we had and so forth—were way behind us. So now all of the sudden you have a whole new set of circumstances. You can do anything that you want. You don't have to give up a job to do something else, because you don't have a job.

Which would have been more difficult, I imagine.

Which would have been much more difficult? And that's when the firm was opened, when the war was over. And it was a real logical time because there was a pent-up need for development that had been held back for a long, long time. It was held back during the Depression because none of the communities had any money to do some of the things that they needed to do; and then the war came along and they couldn't do it then because there was a shortage of material and manpower and so forth. So now all of the sudden, here's all this pent-up demand for services. And we were out of a job; didn't have any place to go; didn't have any needs that were around our necks, you know, other than our immediate families; so it was just a very logical time to start doing something different.

You went to the same school as Jim, MIT. Was it because of friendship or because you both got scholarships there?

It was just Jim had a scholarship from an engineering honorary called Tau Beta Pi, and he hoped that that scholarship would take him to Harvard University to study soils, foundation engineering, and soil mechanics and so forth. And I don't know why it took him to MIT but it did.

Why did he, or you, center on each other as possible partners in a future firm instead of on some other student? Was it because of your friendship?

I think so; I don't know of any other reason. We really were pretty close; we were not just inseparable or anything like that but we were pretty close and had been for a long time. We had a number of parallel interests, and I think that's probably the reason. There were a number of other people, you know, that we'd met back there that we talked along the way about their interests and so forth, but they sort of fell by the wayside. I can't really tell you why we ended up just the two of us having that interest. And Fred and Holly had a separate interest, of course. The two of them, Holly and Jim, got together. And that's how the four of us got together.

Did you have any contact with Fred Merryfield and Holly Cornell when you were back East? You were still friends with Jim, obviously.

Yes. Jim and I were talking about it and then one time when Jim was home on leave—he was overseas, he was in Saipan—he got home on leave and he was talking to Fred about the opportunities here and there and so forth, and that was, as I understand it, where Fred said, "Gee, Holly and I were planning on doing the same thing. Why don't you and Burke join us?" Basically, I think that's how the four got together. And that was something that I really didn't have anything to do with.

How did you get involved with Jackson & Moreland in Boston after graduating from MIT in 1940? What were the circumstances?

Well, after I got through school, I knew that I was going to have to go to work. I had an opportunity to work at Bonneville because of Charles Carey who at that time was the administrator of Bonneville and had been the chief engineer and for whom I had worked for before. I knew that was something that I could do.

For some reason or another I had a feeling that I would like to try to do some other things. At that time, anyone who got any kind of a bachelor's degree had to take a course called Human Engineering. It was basically a course in practical psychology, and a very good one. It was given by a retired naval officer who was a genius in this sort of thing. I took this course along with a lot of other people and it lasted for a whole year. They have a semester system back there.

The fall term was given over to learning how people behave. They were not interested in abnormal psychology. Normal psychology. How people behave. And then the second term was given over to hearing practical problems. It was fantastic. I remember one time there was a strike, a very major strike out in the Midwest.

The first meeting of the month we were given an overview of the background. The second meeting we had a representative of management from the strike-bound people who made their presentation. And then the next week we had a representative from labor who gave their side. The fourth meeting was given over to discussion, and then we write the thing up and hand it in. Absolutely excellent experience. So I said to this guy that was teaching it, "Gee, I need to write a letter to a number of people to try to get a job and I wonder if you would help me?" And he said, "Sure." So I started writing this letter, and it turned out to take just a long, long time. I wrote that letter and rewrote it and rewrote it and rewrote it until it really was a fantastic letter. It wasn't all mine; it was largely his because of his suggestions and questions.

It was stated correctly so it would look like you were...

Well, you know, it was short so that somebody would read it, but it said a heck of a lot. It was probably the finest letter that I ever wrote or ever will write, and it certainly took more time than any others I've ever written. So I sent it to the Pacific Gas and Electric Company in San Francisco. But I also made other copies of it and sent it to a large number of schools and to a number of industries and utilities. I think I sent out about seventy all together.

Of the same letter?

Of the same letter. It was a different address, you know. Maybe a minor change, real minor change, here or there and certainly a different address. And out of that, I got, oh, like two-thirds replies which was, I

thought, exceptional. Even more exceptional was the fact that I had about six outright offers of a job in 1940 when the Depression was just getting over with, and about eight or ten other requests that I come for an interview. And they would pay. So it was really a very successful letter.

I hope you kept it.

I think I probably have it up at the house. It really was exceptionally well done; and the reason it was well done was because of this guy, McGown. So I had a whole bunch of opportunities that I could follow besides going to Bonneville, and I was in the process of going through these and trying to decide which one of these I wanted to go. Incidentally, the one that I really wanted to go to work for was the Pacific Gas and Electric Company, and they said, "Thanks, but no thanks. We don't have any room for anybody this year."

You wanted to come out West again?

Yes. So right in the midst of this evaluation I got a telephone call from the Dean's office—the Dean of Engineering—his name was Moreland. I went up to see him, and he said he had gotten a call from his senior partner in this engineering firm that he had downtown—Jackson and Moreland—and the senior partner said, "I'd like to get two graduate students this year and I'd like for you to pick out a couple of them and send them over." Well, that's how I went to Jackson and Moreland. I went over there and interviewed them, and they were doing the kind of work that I was interested in doing. It was a very well-known engineering firm in that part of the country, one of the better ones, as a matter of fact. I thought that was a real opportunity so I accepted the job. That's how I went to work at Jackson and Moreland.

Now, was Ralph Booth...?

Ralph Booth? How did you know that name?

Well I read about him in the archives. I understand you admired him greatly.

Well, I think that he was one of the finest engineers I've ever known, if not the finest. There is no question about it. There are few people that have his overall stature that I've ever known. He's great. He really was.

Did you work closely with him?

Pretty closely. He was the senior partner in the firm and I was just a beginning engineer so there's got to be a reasonable remoteness there. I had a desk in a sizeable room. It had maybe fifteen or twenty desks in it. All the principals had offices along the side: his was in the corner; Ed Moreland's was over there in the other corner; and then other people along the route. And so I used to see him all the time. He had that attribute of... every once in a while he'd come in and he'd sit down on the corner of my desk and wonder, you know, what are you doing? And you could sit down and tell him what you were doing, and in just a few

minutes he would have absorbed all the things that you'd done for maybe a month or two months, and would be starting to suggest some of the things that you might be looking at tomorrow.

Had an absolutely amazing insight. Fantastic person. And from a personality standpoint, he was absolutely fantastic, too. He was the reason why they had all these jobs that they had. You just can't believe how fantastic a person he was.

The first differential analyzer, which was the forerunner of the computer, was put together on a drafting table at Jackson & Moreland's office by Ralph Booth, and a fellow by the name of Vannevar Bush, whom you may or may not have heard of. Vannevar Bush was a very famous scientist. He was Dean of Engineering at MIT as a matter of fact way back in the twenties. And then he was head of the Manhattan Project—the atomic bomb project—head of the National Security Agency during the war, and so forth. Probably one of the senior scientists in the U.S. over a long period of time.

But this was the sort of person that Ralph Booth was. Absolutely great. It was a real experience getting to work even in the same office with him.

Was he influential in your life as to the direction of your career?

Oh, I'm sure he was. Yes. I'm sure he was though I would have difficulty pointing out specific examples of things that he had done.

So many of the engineers you have known over the years still stand out in your memory. Why did you go to Tulsa then if you were satisfied at Jackson and Moreland?

Well, after I'd worked for them... Different engineering firms have different feelings about what is important in their work. An engineer has two problems: he has a problem in analysis; and he has a problem about what he is going to do about it. You analyze a problem and then you design something to fit with what you analyzed, you see. Jackson & Moreland were great analysts. That's what they were interested in was analysis.

Design to them was something that was not so important. And the people who did design were not as highly qualified as the analysts on the basis that analysis was the more difficult; and probably is, probably takes a smarter person to analyze something than it does someone to design something following the analysis. But in any case, analysis was important to them and design was not as important; and I was in their analysis department, and to them, that was the highest point you could aspire to.

After I'd been there for a year, year and a half, I said, "Gee, I'd like to get some experience in design." And they said, "No, you don't want to get experience in design. You don't need that. You're in the analysis group. That's our senior group. On the fifth floor. You don't want to get up in the sixth floor with all those draftsmen." I felt rather strongly about it and

when an opportunity came along to get into design in another firm, I left. That's the reason—to get the experience.

Now the opportunity that happened was that there was this firm out in Oklahoma called W. R. Holway & Associates. They were building a large hydroelectric project, had it partially finished. W. R. Holway & Associates was made up of W. R. Holway, his wife, who was quite a fantastic person, and two sons, Don and Bill Holway. Bill Holway was still in Dartmouth going to school. Don Holway had been at MIT, and had been a close friend of Jim's and mine when he was there. He had gone back to Tulsa and was working for his dad. Then he wanted to leave and get an advanced degree. He wanted to get a master's degree. But they wouldn't let him leave until they found someone to replace him.

So that was when they called me and asked me if I would consider coming out taking Don's place while he was getting his degree. And it gave me an opportunity to get the design experience and so forth.

This was because of your friendship with the son?

That's how the contact was made, yes. Don made the selection, obviously. His dad didn't know me from a hunk of coal. But Don made the selection and we've been very close ever since. I've talked to him over the phone every once in a while and so forth. It was an interesting experience. Well, then the war came along, you see.

Okay, I was going to ask you about that.

Yes. I went out there to Oklahoma in November of 1941, and then the war came along. Actually, they were designing another hydroelectric plant in North Carolina, and I went back to North Carolina in the summer of 1942 to work on that. The war started in December of 1941. That was when I was negotiating with the Navy and the Marine Corps for a commission, and really wanted one out of the Marine Corps for some silly reason. Charlie Carey turned that one off by refusing to give me a letter of recommendation and so I got new letters and sent them in to the Navy, and in the fall of 1942 I was commissioned. That North Carolina project was about finished, and I left about the first of November of 1942 and went into active naval service.

Had you gotten the design experience that you wanted by that time?

Well, not as much... You don't get that in a year. But like most learning curves it is pretty steep at the beginning; you learn more the first month than you do the second month. And so in the twelve months that I'd had, I had acquired some experience in the design field. No, I don't think it was as much as I was looking for or hoping for, but the war took care of that.

How did you use your electrical engineering background in the Navy?

Well, I was hoping for shipboard duty in the Navy. My eyes weren't good enough; my eyes were just barely good enough to get a commission, as a

matter of fact. So they sent me back to Boston to teach electronics in the Radar School at MIT. So I went back to MIT and taught. I was there teaching most of the time until the summer of 1944.

And that's when you got out?

No. Then they sent me out on a cruiser as an observer. The Executive Officer on the cruiser came to me on the first day I was there and said, "I don't believe in observers. Everybody on my ship works, and you're no exception." So he put me as a watch officer in Division 10 which was the division which had the radar and some other things called Combat Information.

Their operation was called the Combat Information Center—CIC. Everybody else on the ship called it, "Christ, I'm Confused." (Laughter) But that's what I was doing; I was one of the division officers in the CIC, one of four. Later on, the senior officer had a falling out with the Captain over a discussion about whether it was possible for us to make some changes in some equipment the Captain had up on the bridge. This fellow said that he couldn't make the changes for one reason or another so the Captain fired him and put him on something else. And he [the Captain] just decided he was going to go down the list, I guess, so he called me up there and he said, "Can you make the changes?" I said, "Sure." "Okay, you've got the job."

So I became the CIC officer, which was a very interesting job. A very interesting job. It has to do with combat intelligence. Every semblance of information on which the ship behaves on a combat mission comes through the Combat Information Center, and from there it's disseminated to where it needs to go—fire control information and everything. You know, blind navigation. Everything goes through the CIC. So, you know, it's very interesting.

The ship was originally supposed to be on convoy duty. The invasion in Normandy had been concluded. Troops were ashore; they weren't moving very fast but they were ashore. The next invasion was scheduled in southern France on August 15, 1944. And they were short of ships for shore bombardment so they transferred the ship that I was on for convoy duty to combat duty instead of coming home like we were supposed to. I was over in the Mediterranean and enjoying life, I guess I have seldom had more fun than I had there. Even then under wartime conditions it was just a lot of fun. I enjoyed it immensely. You know, I didn't get hurt and nobody else got hurt on the ship that I know of—maybe a few skinned fingers or something—but it was a very interesting experience.

You were on the ship most of the time?

I was on the ship all the time then. We got off very, very seldom. We were very busy; we had operation orders that we had to learn. The interesting part about it was that the CIC officer and the Executive Officer and the Gunnery Officer and the Navigating Officer were the ones that

were briefed as to what we were going to do before anybody else on the ship knew where we were going. That's the only way you could keep it a secret, you see. So, I was one of four officers on the ship that knew what we were going to do: when we were going to do it, how we were going to go about it and so forth, while the other thousand people aboard ship didn't know what was going on. That's the way it always is. So it is a very interesting job. You are still a junior officer. The rest of them are all commanders but that didn't make any difference. It still was fun.

You're the first serviceman I've talked to that had a good experience during the war.

Well, you know, it could have been a lot different but I enjoyed it. Got to see Winston Churchill.

Oh, you did?

Yes, the evening before the invasion of France—of course, Winston Churchill was one of the great exponents of the invasion of southern France. If it hadn't of been for Winston Churchill, we wouldn't have done it cause I think the Americans really didn't want to mount that offensive. But the night before we went in there, as the task force was steaming north towards the French coast, why this target came up over the horizon and the lead destroyers identified it as a British destroyer. As it came closer, the Executive Officer, up on the bridge, called me up on the telephone and said, "Come on outside. You've got a sight to see." So I came outside and here was this destroyer coming right down through the middle of the task force, coming the opposite direction, with all the signal flags flying, and a British four-star admiral aboard with his flag flying. I had a pair of binoculars, and I looked over there at the bridge, and here's Winston Churchill in his blue coat and his funny hat and his cigar standing there. (Laughter) Smoking his cigar and they had a flag flying up there which was a signal for good luck. Right out through the convoy, and right through the task force. It was kind of interesting.

Yes, that's great.

He looked just like he does in the pictures.

Did he really?

Just exactly. All kind of huddled up.

Yes, right. That's like the pictures I've seen. A remarkable man.

Sure was. A lot of people had real bad experiences in the war but I didn't. I was very fortunate in that respect. The only bad experience I had was I got seasick one time, and that lasted for three days and it was terrible. But, anyway, I was on a cruiser and we bombarded the shore on an area called Rade d'Aglay, which is a little peninsula not too far from Saint-Raphael in that country [France], right on the Riviera.

About ten years ago, Billie and I were back over in Europe and we got to Nice which isn't very far away. And I said, "Gee, I'd sure like to go back and see that area, see how I remembered it and see what it looks like now." So I rented a car. [Billie] didn't want to go because we were with a group and they had some things they were going to do in Nice. So I rented a car and drove down to Saint-Raphael and down towards this beach and it was real interesting. It was just very interesting. There was a monument there to the 36th Division, I think, that landed where we were bombarding.

I was taking movies, and while I was there with my movie camera—I'd just left—an elderly Frenchman walked up to the monument and stood there, and was reading the inscriptions on it and so forth, and when he got through he saluted; and I got a picture of it.

Oh.

I have no idea where he came from or why he was there, or why he did that but, you know, it was really kind of touching. On top of one of the hills the Germans had had a radar station which was one of our primary targets and one of the first things that we knocked out. You know, as I remembered it, from standing on the decks of the ship and looking at it, it was quite a promontory—fairly steep and impressive looking and so forth.

It really wasn't impressive when I looked at it the second time; it wasn't much more than a little mound that was covered with houses. You know, people had built all over that area; houses all over everything. The old radar station, of course, was long gone. We pretty well demolished it anyway. I couldn't find the chateau which the Germans were using as a command post, built, apparently, of very heavy masonry, which we spent a lot of time and effort trying to make unusable. It was right in that immediate vicinity. It must have been removed stone by stone because it was gone. I'm sure we damaged it pretty badly even though it was very, very heavy material. I would imagine that it was damaged so it would be difficult to rebuild.

The interesting thing about it was the Germans had a bunch of machine gun emplacements on the beach that were made of concrete. There were hundreds of them. We were only a mile offshore when we were shooting. We could see people on the beach, you see, but it was difficult to see all these emplacements from the ship and so I thought I'm going to spend a little time looking around on the beach to see if I can find them. And I could.

You could?

I could find hundreds of them. They were in perfect condition. We didn't hit very many of them apparently. Of course all of the armament had been taken away. They were fairly sizeable—as big as this room—and sort of round a little, a little dome on it and so forth. The French use them as receptacles for garbage.

Good idea.

But there were a lot of them, just a lot of them. It was interesting to get back. That was the only engagement of note that we were in really so I never got back. I've been real interested in the Ardennes Offensive in 1944, late 1944, The Battle of the Bulge so-called. Last spring when [Billie and I] were over there, we spent two weeks running around through that country. I had a car. I read extensively on the subject and so I knew where I wanted to go. I really didn't miss very many places. I had hoped, originally, to follow the German offensive thrusts of the various groups—you know, just follow right along the line that they went—but I didn't have time to do that. I had stomach flu, and my wife had stomach flu, and that used up some of my time and zapped some of my desire to go walking around through the countryside. But it was a lot of fun.

Did you see The Rise and Fall of the Third Reich on TV on PBS?

Oh, no, I didn't see that. But I have seen it before and I've read the book. The two world wars have been a real interest to me. The first one was a real interest because I was a little kid and it made a lot of impression on me. I was only six when the armistice was signed and I can remember the fire bell ringing and a whole bunch of things. It made a big impression on me. That and a few years immediately after that when all the Germans were having such a bad time with inflation and so forth. They had a terrible time.

Have you been watching the series, the Winds of War?

No, I missed the first two sessions.

Why are you so interested in war history?

Oh, I don't know.

Anything particular? Or history in general?

Well, history in general has always been a real interest to me. The history of the twentieth century has been of more interest to me than modern history [before] that, or medieval and ancient history. But I've always been a history buff. History was one subject that I never had any problems with.

Is it unusual for an engineer to enjoy history?

Oh, maybe. I still enjoy it. I read it. You know, I read all that stuff that I can get my hands on. And I seem to be able to remember most of it, where a lot of the stuff that would pay more money I can sort of forget. (Chuckles)

Oh, now, come on. Did you say you're planning a trip to Spain?

Well, we aren't really. We haven't anything definitive. Billie would like for me to go over there with her. She loved the Portuguese. I don't know whether the name Riviera is the proper name or not but they have

recreational areas on the beaches all along through Spain and Portugal. She thought the areas in Portugal were beautiful. She loved them. The ones in Spain she didn't care for, and the reason she didn't care for them is she said it was just like being in New York City.

Portugal is not as touched by tourists as the other places. Are you interested in going?

Oh, sure. Oh, yeah. Generally, I'm not as interested in Spain and Portugal and that part of the world, I guess, as I am in northern Europe. But, I'd love to go. We'll make it. She wants to get to Egypt, too. We had planned, you know, on doing part of Egypt this last time but, gee, the trip became unmanageable. We were gone five or six weeks as it was and we really couldn't have done it in less than two, or two and one-half, months and that's just too much. I was tired when we got home and so was she. It's nice to be able to get home. I think it's really nicer if you can take trips of about a month in duration, and then come home, and then look forward to one in the future.

What were your goals after the war? Had you thought about it?

No. During the war, you know, there were so many things going on. There were so many uncertainties that I really didn't give much thought to what was going to go on until you could see the end of the war coming. After Patton's breakout in Normandy in the early part of August, it was pretty obvious that the war wasn't going to keep going a lot longer. Didn't know about the war in Japan, but you knew the war in Europe wasn't going to go on. And then I guess we started thinking about what we might do. But I can't remember any details. I came home after the Mediterranean... after the first of September, the Mediterranean was like a calm lake—there was no fighting going on in there and so they transferred me home back to MIT to go on with my teaching.

Did teaching appeal to you?

Yes. Teaching appealed to me. I enjoyed it. I was a lecturer and my subject, at that time, was fire control—fire control by radar as contrasted with the conventional techniques that we used. I had an interesting bunch of people that I was teaching. Most of them were career officers out of the Navy, naval officers, graduates of the Naval Academy out of the Pacific fleets that were back for training. They were all much senior to me—all lieutenant commanders and commanders; and they were an interesting group of people to work with. I'd have maybe ten or twelve in a class.

Had you been in contact with Jim Howland?

We wrote. Not often but we did write back and forth and so forth. But it wasn't until after the war was over, you know, then we started talking objectively about doing something about it.

In a letter from Holly Cornell, Jim Howland mentioned you as being hesitant to come out West.

Well, yes, that's probably true. I had an opportunity to teach electrical engineering at MIT after the war. The head of the Department of Electrical Engineering was head of this Radar School, and I had been working with him, and he came in one day and he said, "When things settle down, why don't you come on over to the Institute. We've got an assistant professorship for you." And I said, "Gee, your people over there are strong mathematically and I never really have been." I remember this conversation. And I told him that I wasn't sure that I would fit. And I remember his answer. He said, "Well, that may be true. But," he said, "Somebody's got to know how the damn telephone works." (Laughter) What he meant was that in order to have a balanced department, he had to have people there who were analysts, and he had to have some other people there who had a practical aspect to it, to maintain balance.

He felt that you had that background?

Apparently he felt that I would help him maintain that balance. Now, my reservation about coming out here stemmed only from the standpoint that we didn't have very much to do. You know, Holly was already out here working. This was, oh, October or November, I guess, of 1945. He was already here. Jim hadn't gotten home yet, but he was coming. He came to Boston first, and we got together in Boston and talked about it, and I talked to Holly on the phone about it. I did have some... I was wondering if it would be wise for me to defer coming out there for six months to a year and Holly said, "I don't think so. I think we'd better all get together and make it go now or forget the whole thing." So I agreed and that was that.

Your hesitation didn't last long then?

No, the hesitation didn't last long.

COMING TOGETHER IN CORVALLIS

Why did you want to start the firm in Corvallis? Why not some place more centrally located like a larger city with possibly more projects?

Good question. Fred was teaching part time. He was a part-time professor of sanitary engineering. Fred loved to teach, and Fred was a great teacher so it would have been real bad for him to give up his teaching, I think. I don't know if anybody else would agree with that but I think that's true. If he was going to practice with us, it was necessary that we be close to him or else we would never get to see him. That is one reason.

The second reason we selected here was that late in the war I went over to the Jackson & Moreland offices in Boston and talked to Ralph Booth and he said to me, "What are you going to do after the war? Are you going to come back?" See, I'd been out in Oklahoma for a year.

He remembered you.

Oh, yes. We were pretty close friends. He said, "Are you coming back? We'd like to have you come back." And so I told him, "No. I'm not." And I told him what we were planning on doing that we were going to open this office out here, and he said, "I offer you all kinds of hope and so forth that everything works out". He said, "Let me give you a little fatherly advice. Never let your organization get too far from a university, from some university, keep it close to some university."

And I remember that point because it really has a lot of merit to it; it's the one way that you can keep up with the things that are happening. So that was one of the reasons why we picked Corvallis. Another reason was because we thought that the laboratories that they have over here, which we could rent space in and so forth for conducting experiments, would be valuable; and that was not true. That really doesn't make any difference whether you have a laboratory or not; that is not really material; that was a mistake.

Another reason was that we thought that we would have a source of undergraduate students that we could use for part-time help. That wasn't worth anything either, because that part-time help is the most expensive labor you can buy.

What do you mean?

They're not interested in what you are doing; they are interested in going to school and everything bends around their school program and should. So that doesn't work. If you are going to have a group of people, you have to have people that are dedicated to your job and not to something else.

The other reason was that we thought that we needed to be close to a library—a technical library. And that is a valid suggestion. So that is the reason why we ended up in Corvallis—those are the reasons.

Had you considered other options—other places?

Not really.

I understand that Holly Cornell and Fred Merryfield had started before you even came back from the Navy. Had you been a part of the decision process that resulted in the firm coming here?

Well, I think it was just automatic. See, Holly was in the Corps of Engineers, and had been in the European Theater and the war was over there in May, so he came back with all the other troops and was being retrained for the invasion of Japan, when the war was over. Okay, now, he'd been overseas, he'd been in the Army for a long time, and he had a lot of points. They had a point system; the more points you had, the earlier you got out. He has as many points as anyone could have, and so he was mustered out of the service early, probably in October, maybe in September of 1945. He immediately came home and was available to start work.

Fred was already here. The war was over for Jim but he couldn't get home. He was in Saipan, and it was December or late November before he got home, and he immediately came to Boston and we sat down and talked there. I had not been in the Navy, you see, the first year of the war; and I hadn't been overseas as many months as Jim had been or Holly had been, so I didn't have many points and I didn't get out until the first of January. So that's the reason why Holly got out first, and that's the reason why Jim got out second, and I got out last. And that's the reason for the name, for the sequence of the names.

The sequence was whoever was the first person here in Corvallis came first—Holly and Fred, then Jim and you?

Yes.

Then why was Merryfield's name last?

He said that it would sound better. The [firm] name would sound better if you had the long and complicated name last, and he's right. Think of how it would go if you said, "Cornell, Merryfield"—you know, you get your tongue all twisted up.

I agree.

He just said that it would sound better if the long and complicated name was last and he insisted on that. I think he's right. Fred could see many things of this nature. And as far as the other part of it was concerned, why, you know, the names were put in series in terms of when they got out of the service. But even so, you know, it's a funny thing about names: you need to have some staccato pieces in a name. There is nothing staccato in the name Hayes, nothing staccato in it at all, and so that's something that needs to be passive and in the middle. You need a staccato thing to start with and the only one you've got is "Car" of Cornell,

you see. So, to me, it was real fortuitous that Holly had more overseas duty than anybody else and got out first and got his name first, because it wouldn't have sounded nearly as well if you put it in any other sequence. And the big name had to be last.

What motivated you to want to start your own firm? What kind of expectations did you have?

Well, I don't think we really understood what all the problems were. If we had, we might not have done it. And you have to realize that we were very, very fortunate in the timing and in the location and in the people that we were, and that we had, and the other people that were involved. We were interested in pursuing a professional association and we couldn't think of anything that would inspire us more than to have our own engineering organization and that's the reason that we set it up.

But it would have been so much more secure to work for some other established firm, say, back east or with your friend Ralph Booth? What motivates a person to want to start their own firm with the challenges and the possible threat of failing?

Well, we didn't think about failing. That didn't enter our minds. There is, you know, a facet to being your own boss: to some degree controlling your own destiny, making your own decisions, developing your own organization, leaving something behind you, your own castle of some kind. I think those are the reasons why we were interested.

I am not so sure that the younger people have that much of an interest right now as they had, say, even fifteen or twenty years ago, because a lot of things have changed. But twenty, thirty, forty years ago, that's what everyone wanted to do. They wanted to be their own master. They wanted to have their own organization. I think an awful lot of the young people now are much more content to take the route of what they believe is security without the risks. And I don't think they value the ownership as much as people used to value it.

Do you think it is because it is more difficult to start a business today than it was when you started CH2M?

No, I don't think so. It may be a little more difficult. I can remember when people in New England found out that I was coming out here, and going to open an engineering firm, they did everything to discourage me. Friends of ours, you know. They'd talk about all the failures of engineering firms, and the difficult times, and that you'd be so much better off to continue to work for someone, or teach, or something like that. These were older people; they were not a whole generation ahead of us but they were a half a generation ahead of us.

And it has always seemed to me that things go in steps. You have a plateau, and then things change for some reason and then you have another plateau, and they change, and you are rising up. As I visualize

time, I visualize the 1900s, from 1900 to 1914, as being a kind of plateau, and then the war came along and then you have this rise, and then you have a leveled-out period of, oh, through the Depression, and then you have another rise and then you have a long upward slope which is where we've been.

And I think people, and the opportunities, generally tend to respond to these crises. There were a lot more opportunities right at the end of World War I and at the end of World War II and so forth, as there are at the end of any of these big dislocations and traumas of one kind or another. There are all of the sudden a whole lot of opportunities if you could just see them. We were just lucky maybe. Maybe we could perceive it. But we happened on to one, you see. It was a real opportunity—a void in this area insofar as engineering service is concerned.

That void was not nearly as marked in New England; I don't know about the rest of the country, but it wasn't marked in New England. But there was a void here. There was no engineering firm of note in Seattle. There were two established engineering firms in Portland. Both were firms that had elderly people, and they hadn't made the right kind of motions to get younger people in to follow them, you see. And they, that group, were over age and grade. And everyone around, well not everyone, but a lot of people around recognized this. So they were looking for somebody with a new way to do things. And that's what we offered.

Why did you think that you personally could fill this void?

(Laughter) I don't know. I really don't know. After we had opened the office, the father of a very close friend of mine, one of the very high officials in the U.S. National Bank, spent an hour one day up in Portland telling me all the problems that we were going to have: all the engineers that had gone under and there had been in the depression—just a lot of them. But he didn't realize, you see, that things were different, just like he thought the cost of housing was going to rise, fifteen or twenty percent and then level off.

And you had recognized that those were different times?

Well, I'm not sure that we were that smart really but we thought that we could make it, so we were going to try.

Where did you foresee your expertise in electrical engineering fitting in with the firm's goals, and its future, and so forth?

Well, I guess I didn't have a clear view of where that might lead. Any project of any size involves some electrical work and so that's a factor. Most engineering firms of twenty-five, thirty, thirty-five years ago didn't have any electricals or any mechanicals. What work was done, the civils tried to do themselves and in many instances it wasn't really done very well.

And I think that was one of the things which gave us something of an advantage—that we had some mechanical and some electrical know-how which many of the other firms just didn't have and either farmed out, or tried to do themselves, or to get manufacturers to do for them, or something of this nature. Of course, we always hoped to develop some utility work and other electrical work.

As a matter of fact, at the time that we were just getting the firm started and maybe just before I came out here, I had given some real serious thought to other things which are related to electrical engineering. I remember one thing that I thought of—I don't know that I communicated this to any of the other fellows—was the possibility of working with railroads to develop a communications system whereby the railroad dispatching people could talk to the operating people on locomotives, and the yard people could talk to the yard locomotive people when they were making up trains in yards, and so forth.

Now this was all something which was being done by the Baltimore and Ohio Railroad. Through some friends of Billie's parents, who lived in Baltimore and were officials in the Baltimore and Ohio Railroad, I got to meet and talk to the chief engineer of the Baltimore and Ohio and he was telling me about some of the things that they were doing. This was one of the developments that they were giving serious consideration to and something that I was real interested in. So there were a whole lot of places, at one time, where the electrical aspects of it looked as though they might have a real interest to the firm. Not all of them worked out, obviously.

Were you thinking of working with the railroad in this way through the firm or on your own?

No, no. Through the firm.

I think you mentioned before, that the electrical part of the firm hadn't been developed as much as other areas?

Well, it hasn't. And it hasn't now. And yet, you know, the electrical utility work, at the moment, is a very, very important part of our effort. It's worth a great deal; it's worth a great deal to the firm right now. But even so, when you compare it with the volume of work that is done in the water and waste area, it's small. You know, this office here is doing [electrical] work for one client in the area which will provide fees of close to ten million dollars. But that's small compared to the overall effort, the firm wide effort, in the water and waste area, because of the environmental problems and so forth.

And basically, that's where we really got our start; that's where we got our name and so forth. We had hoped that we would be able to develop an office which would have many facets. The reason being that as problems rose and fell, why the efforts of the firm would wax and wane in a given area, but if we had many facets, why the waxing and the waning

might melt into something that's fairly uniform, and we wouldn't be plagued with the problem of feast and famine like most engineering firms are.

And to some degree, that's worked out pretty well because we really have had a much more stable employment record than most engineering firms. Part of that's luck, but part of it is because of the multidiscipline effort that was established way back when the firm was opened when Holly was a structural and Jim was interested in foundations and soils work, and Fred was water and waste, and I was interested in the mechanical and electrical area.

So when you first started, you were thinking of it as a team effort for each specific project?

That's right.

What contributions did you feel you were bringing to the new firm?

That's hard to say. I guess, one, that I had the experience of having worked for two consultants so I knew some of the techniques that they did, and they had to work with: the forms, the computation paper, the business forms, the time sheets, how you keep track of your time.

I understand you designed the first graph paper for CH2M?

Yes, that's right. And the first time sheets and the first expense sheets and so forth. When I left New England, Ralph Booth gave me a copy of all of the stuff they had—all the forms that they used—and so, basically, most of the early computation sheets and expense forms and time sheets and so forth were very similar to theirs.

In Oklahoma we didn't have anything like that. That engineering firm didn't have time sheets and they didn't have computation paper. There was only one project and everybody was working on one project so they didn't need one I guess. But it did seem to me that these things were desirable, and so we put them together and a whole lot of little things like that. I built the first printing machine I had almost forgotten about that. It didn't really work very well but it didn't cost very much either, and for the first five or six years that's the printing machine that we used.

Was this a model after...?

No, no, it was just... it was really pretty elementary. But it worked. It was cheap, and that's what we needed. We didn't have much money to invest in it.

These are some of the contributions you feel that you brought to the firm?

I think there were probably others. One of the things that we were able to do, was to provide a balanced approach to these projects that we were doing. So very often in the past, if the engineering firms were doing process for example, like water treatment or something, they'd have

someone who would be an expert at water treatment—a then expert in water treatment—and someone who could do the structural work, but the electrical work and things of that nature weren't done very well. They really weren't done very well. They usually would let somebody from the outside do them.

We didn't do that; you see. The electrical work was done as a part of the rest of the project and it was done more carefully and thought out more carefully and it worked better. It had more innovations. Our plant could do things that other plants couldn't do. It had better instrumentation and better control.

Were you responsible for these innovations?

Some of them, yes. Not all of them but some of them. And then, of course, we tried to get into the electric power field. And that was not the easiest thing that we ever did. We got into some electric power but it didn't grow as rapidly as the water, wastewater, and things of that nature. It's been growing consistently and it's still getting bigger and we're doing some sizable projects now in the electric power field. But the others took off and grew very rapidly. The electric power field has not; it's grown consistently but slower.

Is that because of the competition?

Oh, I suppose, yes, probably.

In those early years, did you have any reservations about starting the firm in the direction it was going?

No, not really.

You were very optimistic?

I was optimistic. Yes. You know, we had to be willing to make some concessions. Our income was a lot lower than a lot of the other people around because we had to put a substantial part of the income from the firm back into it to let it grow and so forth, so we had a lot less to do with than some of our friends and so forth. But that's all right; it worked.

It obviously did. Can you describe the feeling in those early years as more projects were coming in? At your board meetings, was there a feeling of excitement?

Yes, I think it was a feeling of excitement. And confidence. We had a tremendous feeling of confidence.

Because clients were choosing you?

Yes, hummm. Because things were working, we were trying and we could see results from the trials that we had. Yes, I think that we were very confident; I don't think that we were overconfident. We had a lot of problems but they were not as serious as they might have been. We managed to get beyond the problem stage.

Interestingly enough, we opened the office in about the first of February of 1946 and by the first of April of 1946 Fred was doing his thing, and Holly was doing his thing, and I was doing my thing, and Jim was doing his thing, and no one was managing it; no one was managing the organization and giving it any direction and so forth. Jim came in one morning and he said, "This outfit needs a manager and if you guys aren't going to manage it, I will." So we said, "Fine." (laughter) And he was the manager for the next twenty-five years. He kept saying, "Now, I'll be glad to resign and turn this thing over to somebody else." But he had done a good job. We didn't want to lose him.

CONTRIBUTIONS OF PRINCIPALS

Oh, I was going to ask what you felt the contributions of Jim Howland have been to the firm.



Jim Howland

Oh, I think by all odds that is probably the most important. There are many contributions that everyone made, but the most important one that Jim made was that one of management. Early management. Keeping things together and headed in some reasonable direction. That was Jim.

He had the skills to manage an organization and manage people?

He had them. And he exercised them. He did an excellent job. He really did a fantastic job. Holly had the same abilities but Holly, at that time, was more interested in pursuing the structural options and doing the structural work and some of the process work and so forth. He wanted to be an engineer. Jim wanted to be an engineer, but he knew that we had to have a manager; so he managed. He didn't get to do very much engineering as a result of that. He's the only person in the firm who's never had a promotion (chuckles).

He was equally as good at each job—managing people and also engineering?

Yes, that's right. He did a great job. And, of course, he's been recognized. Everyone says, you know, "Gee, what a great job a". But they haven't recognized everybody else—like Ralph Roderick.

I'm going to ask about him in a little bit. In an interview with Hilton, you told a story about when Jim Howland went down to Florida and saw the cars there. It gave some insight into this man. Could you repeat the story here?

You're talking about the black Cadillacs I think.

Right.

Well, Holly was the one who really had done all the negotiating with Hercules Powder over the purchase of this firm Black, Crow and Eidsness. After the negotiations were essentially finished, Jim went down there on an inspection trip. And Jim doesn't believe in high-backed chairs like this one; that's bad; he doesn't think that people should have high-backed chairs. He doesn't believe in big cars; Chevrolets are as big as anything you ought to ever have. He's said these things, you know. It's not my idea; he said them; he believes them. There is nothing ostentatious about Jim.

There is no reason for having a Cadillac. You know, you don't need one; you don't need anything that big; you don't need anything that expensive. And so he went down there on this inspection. He got home over the weekend, and he came up one Saturday morning, and he was shaking his

head, and he said, "Boy, we've got big problems down there in Florida." And I said, "What, do you mean we've got big problems?" "Oh," he said, "Those people all drive big black Cadillacs." (Chuckles) And to him it was a disaster. This was their attitude. You know, it wasn't just necessarily the Cadillac. It was the attitude, you see, that was displayed.

Oh. Did he have problems with you others that didn't have this same philosophy? For example, you and your high-backed chair here.

Well, you know, this high-backed chair was probably one of the cheapest desk chairs that we bought because I got it through the Confederated Tribes of the Warm Springs Reservation. These are the chairs that they have in their board room. That's where I first saw them and I said, "Gee whiz, where did you get those chairs?" And they told me; and so I put in an order, I think through them, for a chair just like theirs, because it's comfortable and it leans back, you know, and I like to have something where I can put my head back on, because sometimes I lean back and do my dreaming or whatever it is that I'm doing. But that's a form of ostentatiousness that Jim does not like.

But he wasn't upset when you or Archie or some of the...

No. Ralph didn't like a Ford or a Chevrolet. He said, "I want a Buick." "Okay. You can have a Buick. You just pay the incremental cost of it." So, that's what Ralph did. He paid the difference and he always drove Buicks.

Oh, you mean as a company car?

Yeah. But, you know, different people have different...

It would seem that Howland would have problems with this philosophy. I'm sure that he had had to run around in circles where there are presidents of other companies, few of whom would think as he does.

Well, you know, at that time that really wasn't a problem. Jim didn't believe in air conditioning.

In Corvallis you mean?

Well, he'd permit the firm cars in Boise to have air conditioning but the ones in Corvallis couldn't have air conditioning, and in order to get the air conditioning in my firm car, I used to have to negotiate, you know—well, we'll-take-this-out-of-it-if-I-can-have- that sort of thing. That's the way I used to get air conditioning in my car. (chuckles) But there's nothing ostentatious about Jim; and there's not very much ostentatious about Holly as far as that's concerned. I do like a big car; I like the way they drive; I like the way they feel; I wouldn't pay the money for one, but I'd buy one about which somebody else has said, "Gee, you know, I'm through with this." I never buy new cars anyway.

Well, you probably know how to work on them.

Well. Yeah. I think I have a better sense for picking out one that's maybe a good piece of equipment. Neither my wife nor I believe in buying [new cars]. The only new car that we have purchased was a Suburban and we had to buy it for a special purpose.

For your boat?

That's for pulling that boat. All the other cars we've ever had throughout our marriage have been used cars.

Do you have other comments about Jim Howland?

Well, you know, there is no way that anyone can thank Jim adequately for the job that he did. There isn't any way they can do it because, you know, his was a tremendously important job. He took over the management of the firm when it was, I think, it was maybe two months old. He came in one morning and he said to me and Holly. "Somebody has got to manage this outfit and if you two won't do it, I will," and he was the manager from then on.

And you know, he did such a good job and, you know, I don't really think that Jim enjoyed it that much; there were other things that he really would like to have done. He was a talented technician and he was a talented artist, and I'm sure there were many things that Jim would like to have done, or have had time to do, but he was dedicated and he took on that job of managing and just did a tremendous job of it.

I don't think that anybody can give him enough praise to really adequately thank him for what he's done. Jim's scheme for management, I thought, was just what we needed for the first twenty-five years of operation. After that, the firm gets to the size where you've got to be tougher in getting people to do the things that you want them to do. And that is just not Jim's style.

And he recognized that, too, do you think?

I don't know whether he did or not. I really don't know whether he did or not. There isn't a person on the face of the earth who is more human than Jim Howland. Jim wouldn't hurt anybody. He wouldn't say anything to anybody that would hurt them. It would even bother him to think something about people that would hurt them.

You mentioned earlier that you had not known Holly Cornell until 1946. How did you feel about joining forces with him in this new firm?

You know, when I said I didn't know him, I meant he was not a close friend. But he was someone who I knew of, and in whom I had a great deal of confidence because of the contacts that I'd had in school and the things that I'd seen him do and so



Holly Cornell

forth. So I didn't have any reservations about him. No.

Can you talk about his contributions?

Holly's? Oh, yes. His contributions were, I think, many. He had a very steady hand. He sort of set the tone on specifications. I think the early specifications were designed by Holly—how we organized the specifications and how they were divided up and so forth. I think those were largely his responsibility. He had to have some specifications for some of the jobs that he was doing, and he just took the responsibility for doing to specifications and did them, and I think we still follow the same general scheme for putting them together. So that would be one area.

He was very important to us from the standpoint of getting some of our early work. The work that we got up in Forest Grove—the reservoirs and the water treatment plant and things of that nature which were some of the early jobs that we had—were Holly's responsibility more than anybody else's. So he brought that work in.

That wasn't through Fred Merryfield?

Well, it was initially through Fred. Fred had the contact in Forest Grove with the City Manager and so forth, but I think that Holly was really the one who was ultimately able to get them to have us design that reservoir, the first job that we did for Forest Grove. We might not have been able to get it without Fred's help; but you know, you can push it up to a point, and if you can't get it over the edge, it doesn't drop, and I think Holly was the one that pushed it over the edge. So I think that you have to give him a large share of the credit for some of the early jobs that we had.

A lot of the techniques that were developed, the practices and the Policies and Practices manual—Holly put together. The early work on casualty insurance, and the awareness of the problems of making mistakes, and the insurance for design errors and so forth, that was something that Holly paid attention to before, I think, most anyone else did. The computer was largely his. He was the one that went up to Seattle and opened the Seattle office; that was a very difficult thing to do but he did manage to do it. I have a tendency to ramble.

No, I think you're doing real well. You said you opened the doors in February of 1946. Were you referring to the two rooms of the Smith Building in downtown Corvallis?

Well, that was when Cornell, Howland, Hayes & Merryfield really started operating on the first of February, 1946.

And when had you returned to Corvallis? It must have been days before then?

Just a few days before that.

It must have been exciting to have your own offices?

Well, you know, the offices were pretty sparse. They overlooked the alley. There was a drafting table that Holly had built earlier and had up in his house that we had moved down there. I suspect we didn't have a desk. We really didn't have much to work with. As a matter of fact, I think we had a few drafting instruments and a drafting table and that was about the extent of it.

You had a blueprint machine?

Well, we built that a few days later or started building that a little later.

I know that, Bud Smith was telling me about that.

That was that gadget that I'd built.

Could you comment on Holly Cornell's management style and his contributions to the firm?

Okay. Well, I guess I have to start out by saying that he's an individual in whom I have tremendous confidence. Tremendous confidence. He is a very stabilizing influence. I don't know that I've ever seen Holly really mad. I've seen everybody else mad but I don't think I've ever seen Holly really mad. Very stable individual. And a very solid individual. Not perhaps as warm as many, not as warm as Jim. But very, very stable, very self-contained, very self-assured. Anyone who talked to Holly immediately has confidence in him. He exudes confidence; he always has. In that respect, he's been a tremendous value to us. As a manager, he tends to pick people in whom he has confidence and lets them go off and do their thing. He doesn't look over their shoulder and say, "You know, I want a report back on what you're doing next Tuesday." He expects results and I think people would bust themselves to get results for him.

So it's effective, then?

So it's effective. You know, not everybody can do that.

It worked well in this firm?

Well, it worked well in this firm. Whether it would work well as the office gets larger and larger is hard to say. I think an awful lot would depend upon the ability of the individuals where he gave options, to do their thing. The transition from Holly's management to Harlan Moyer's management has been a problem for some people.

For example, the other day I was asked to help one of the divisions of the office in putting together a proposal that they had for commercially developing a technique that they had developed which is real valuable to the office—they've made a real contribution. Management now wants them to report back to them periodically, formally. And, you know, with hard and fast budgets and all the reasons why you do this, that, and the other thing [this is difficult]. And the people have come back and they've said, "Gee, when others were working at this, we went to them and told them what we wanted to do and we'd get permission to do it, and then

they didn't bug us anymore. They expected us to get it done, and we got it finished and we turned it over to them. You bug us all the time."

You see. Well, there are two sides to that question. You know, management's got to be informed. They've got to know really what's going on in a diverse operation where it's spread out all over Christendom. And yet the transition from one form to another can be a problem to people.

I'll bet. What about Jim Howland's management style? How would you compare these three—Cornell, Moyer and Howland?

Well, I think Jim's was more a family operation. Holly's was more business oriented than Jim's. Jim operated everything like a family. Now, basically it was Jim's decision to leave the Hill people in charge of the Hill property and not make any real attempts to integrate it into CH2M HILL and make it all one organization. And, as a result, to a large degree, the Redding office has never operated in the same way that the other offices of CH2M have operated.

By contrast, when Holly took over Black, Crow and Eidsness down in Florida, the first thing he did was to put our own man in charge as a manager and say to everyone, "If you are going to operate like a CH2M organization, you'll have your own name for one year and then it'll become CH2M, too. But you are a CH2M organization now and you're going to operate that way." And I think that most everyone realized that that was something that you had to do.

When the Hill organization came into CH2M, I think there was a great deal of concern about how you do these things.. For example, the name. In order to make the Hill people feel that they were a part of the organization, we kept the name Hill, and changed the name from CH2M to CH2M HILL. I don't really think that bought very much. At the time we took on the Hill group there were many people who were not real happy in the Hill organization. Some of them were unhappy because they were coming into CH2M. There were a lot of them, major people in the Hill organization that were very unhappy because Clair owned the whole thing and they didn't feel that there was any opportunity for them to ever get out from under his administration. When CH2M took over the Hill organization that changed and it gave a lot of their strong people new horizons, and those strong people, many of them like Harlan, have left Redding and have gone on to other things. We've got a number of Hill people who have left Redding and are CH2M HILL people. But a lot of people in the Redding office are still Clair Hill and Associates.

Do you think that if you'd put your own man down there in Redding right from the beginning, that that wouldn't have been the case?

I think if we'd put our own man down there, there would have been a whole lot of Clair Hill people who would have been unhappy and would have left, but the organization down there would have been stronger. Jim

could not bring himself to make anybody unhappy; he just couldn't. And he felt that they would work better and be happier if he let them go ahead and do their thing. And in a small organization, I think he's right. If you get into a big organization, pretty soon you can't handle it.

Well, as stockholders, couldn't you let your opinions be known?

Well, you see, at that time, the number of stockholders was far less than it is now. I don't remember how many stockholders there were in 1970 but there were a lot less than there are now. A lot less.

But if you and others of you who were stockholders saw this as a problem, couldn't you have made your opinions known?

Yeah, I think you could. As long as things go along smoothly, I don't think stockholders really spend a lot of time looking into the future. They look at results, and if the results are satisfactory they are happy, but they don't look into the future. I think that's true. And I don't think our stockholders, are any different from any others.

Jim Howland realized that his way of managing the firm as one large family was not working out or was not successful. Is that the reason that he stepped down?

No, no, no. I don't think that anybody ever said, "Gee, this is not the right way to run it." And, had Jim stayed on as President, I think we'd still be running to a large degree more in that vein. He'd have to change some as the organization gets bigger because your communication problems change. But this is a management characteristic of Jim's and I think he can make it work a heck of a lot better than most other people could make it work.

Holly couldn't make it work that way; he wouldn't even try; he didn't believe in it. But as long as Jim was doing it, he wouldn't say, "Gee, I think you're making a mistake." When Holly took over the organization, why, I think some of the management... Holly was one of the early students of management in the firm. He was the one that bought the books on management and read them all and studied them. I don't know whether I have any in here now but I remember I had a few and he used to come in and say, "I'd like to borrow that book," and gee, the first thing you'd know why he'd have it digested and he'd be off on another management book. This was when he was up in Seattle and when he first came back to Corvallis.

Jim Poirot, who was Holly's understudy, is the same way—a great student of organization and management. Holly was the one that started management courses within the organization for people: Why you manage the way you do; what are the principles of management; and so forth. This was Holly's work.

What did he think of the way Jim Howland was managing then?

Well, I think that as long as it achieved results, he wouldn't say anything about it. He just wouldn't do it that way, and didn't.

Why was he chosen rather than you, or Archie Rice, or somebody else, as the intermediate President between Moyer and Howland?

I think, well, because he was a better manager. Now, he's not a better manager than Archie. Archie is probably one of the best managers we have and one of the best entrepreneurs that we have. Archie's problem is that people are afraid of him; throughout the firm they are afraid of him.

And we've got other people, very strong people, that people are afraid of, you know, because they're smart and they're capable and they're, [apt to make a] sharp retort. If you're out of step, why, they say, "Hey, you're out of step." Well, people don't like that and if they can keep them out of power, why, they will.

And Archie never really—I guess I'm not sure that Archie ever really wanted to get into that area. But if people hadn't have been afraid of him, he would have made a tremendous manager, probably one of the best. But people were afraid of him. They're still afraid of him and he's retired, you know. He doesn't spend much time around here anymore. They're not afraid of Holly. They're not afraid of Jim; Jim's door was always open; he never had it closed. The office boy felt perfectly free to go in and say, "Jim, I've got a problem;" and you can't find many people where the office boy would even feel like going in there in the first place; or, you can't find many executives who would receive them in the second.

Why did he step down then? What do you think was his motivation?

Well, I don't know. I can't really tell you all the reasons other than the fact that he'd been managing... Every year he used to say, "Gee, I'm ready to step down if you guys will do something else." And we would say, "No, we want you just right where you are."

Why didn't Holly Cornell take over if he was so interested in management?

Well, Holly had other things that he was doing. Holly was managing the technical [areas]; he was the manager of all of the disciplines. That was Holly's job and he did a tremendous job of it. He was good at it; he was great at it. And so he had a job in which he was interested.

Holly was responsible for the *Policies and Procedures Manual*. We never had one of those before; Holly sat down and put that one together. A lot of the other things—the specifications, you know. You need some specifications so Holly sits down and puts them together. He has other people helping him but basically that's a need that he saw and he filled it. I don't know. They're just different people.

Now, I'm not a good manager. I realize it. I think everybody else realizes it and so [it was] never suggested that I would be a good man for the job; and I think we were smart enough to not assume that just because I was

one of the original principals, I ought to follow on to that. Basically, my area of expertise was in the technical area and, to some extent, with people.

But as far as management is concerned, I don't have any interest in it. It's just not my bag and I think, I guess I said once before, I think that's why Ralph Roderick took early retirement. I don't really think Ralph enjoyed that job. He had a job that he was damn good at, and valuable to us, and we took him out of that and put him into management and I think he was miserable from then on. Not everybody's a manager. I'm not and I'd be the first to admit it. Now Holly is a manager. Jim is a manager. They are different types. They manage in different ways. They enjoy it. They do a good job at it.

I wonder why Mr. Roderick didn't communicate that he was unhappy in a management position.

I don't know. And maybe I'm wrong but that's my impression.

Well, others have speculated the same, so I just wondered. I interrupted you about why you thought Jim Howland stepped down.

Well, I think Jim was ready to step down at any time. He was the Chairman of the Board and we had a big job down in San Diego. We needed a project manager. I had always been arguing that the most important job in the firm really was that of a strong project manager, that we needed to convince our people of that, and that the smartest thing that any of us could do when we stepped down from one of these management jobs was to take on a job as a project manager someplace. I don't know how much influence that had on Jim so I can't really tell you all of the reasons, but I think that would have been one. (Chuckles) Jim's the only person in the firm who's never had a promotion.

Well, I wonder why. (Chuckles) Back to when the firm first started business. Did you bring clients there to your downtown office when you had projects?

I can't remember whether we ever had a client in there or not. I would guess probably we did, but I don't remember any. It wasn't much of an office, and we didn't stay there very long. Within a matter of a few months, we had agreed to take over a larger space over the Rexall Drug Store. That building was owned by three people— Rennie, Smith, Allen— and we were in the Rennie part of the building. The Corvallis Clinic was down there. They started at the same time, right next door to us. Dr. Aumann. I know that Charlie Bayles and Ralph Roderick came out from Kansas.

Do you remember your first encounter with Ralph Roderick?

Just in general. Ralph and Charlie had both lived in Kansas. Both of them had been in the Army during the war. Ralph had been out here part of the time during the war and decided this was the area where he really wanted to live. So in the spring of 1946, and I can't tell you exactly when it was,

but it was after we'd moved into the Rennie Building so it was a couple of months after we'd opened, why Ralph came in and Charlie came with him. I think they'd been traveling together. Charlie was his brother-in-law. And they came in and told us about where they had been and what they had been doing and that they wanted to go to work for us. And they were sort of adamant. They were going to go to work for us. (Laughter) And they weren't going to take no for an answer. But we didn't have anything for them to do. Or at least we couldn't think of anything that we had for them to do.

Why did they want to work for you?

I don't know. You know, it was an opportunity. They couldn't find anyone else around, I guess, that they could [work for] and this was a new outfit. I guess they sensed opportunity so they decided that they wanted to go to work for us. I think Jim probably talked to them more than anybody else, but I was a part of the conversation.

Anyway, we told them that we'd keep them in mind, but we didn't have anything for them to do, and they left. And very shortly after that something happened. I think it probably was the Forest Grove reservoir that Holly had been working on. It went into construction, and we had to have a resident engineer. We didn't have one, so we hired Charlie Bayles to do that. And shortly after Charlie came, we decided we had a place for Ralph, and we got him to come, too. And about that time Archie Rice got out of the Army. He was a real junior in the Army compared to most of them, so he didn't get out of the Army until the spring of 1946 or something like that. Fred Merryfield was the one that brought Archie in.

Why Charlie Bayles was never asked to be a partner?

Well, of course, the reason Charlie went to work first was because he satisfied a need that we had for an inspector and a surveyor. I may be mistaken about this, and you might have to check with Holly because it was Holly's job, but I believe that it was the five-million-gallon reservoir for Forest Grove that we were doing where we needed Charlie's help as a surveyor and as a...

I thought he was a resident engineer.

Resident engineer. Well he was a surveyor and a resident engineer, that's right. Now, why didn't he become a principal? He was not a strong technical man; he was not a leader. Fine person and very competent in his area and very dedicated, but he was not the leader type that Ralph Roderick was or Archie Rice was.

Oh. Did that ever cause problems between Bayles and the firm because he was not asked to be a partner while others were?

You know, I can't crawl inside the individual very successfully. I would be surprised if, very quietly, it didn't hurt. I would be very surprised if it

didn't hurt but he never said anything. I guess I'm inclined to think that Charlie realized that he didn't have that strength that Ralph had.

You mean leadership capabilities?

Leadership. He couldn't make a decision. Real difficult to make a decision. And he couldn't do anything new. You know, for a while we had adding machines that had a whole bunch of keys on them and then they came out with an adding machine that had a keyboard like that telephone. You could put any number in it that you wanted. He couldn't adopt one of these. Whenever he needed an adding machine, he kept the old one which was slower. He just refused to learn to use the new ones, you see. Fine person but he just was not a leader and he had trouble making decisions. Real difficulty making decisions.

That's a real liability for an engineer.

Well, we've got lots of engineers that can't make decisions. You know, they'll just research the hell out of something. Doing it over and over and over and over and never say, "This is the way we are going to do it. We've got to start." They say, "Gee, we need to improve this," and "I'm not sure about that," and so forth.

Tell me about Archie's entrance into the firm.

Well, I don't really know that entire story. You would have to get most of it from Archie, I think. Archie came back here—as a matter of fact, the first time I saw him I think he still had his uniform on; he probably didn't have any other clothes, like most of the rest of us. And he'd come down here and talked to Fred. He and Fred had been pretty close friends through the years, and Fred had had him come down to the office and was insistent on our hiring him. I think there was a certain amount of reticence on our part because we couldn't see a need for any more people. There was some general interest on Archie's part. He had been working for the State Board of Health here before he went into the Army, I guess, and he could have gone back to them.



Archie Rice

Now this was the first time you had ever met him?

I had never seen him before.

Had you ever heard about him?

Never heard about him before. And I can remember the negotiations going on up in front of the office, but that's about all I can remember, and finally it was decided that he was going to come to work for us under certain circumstances. Then, for a while, Archie and I shared an office. Holly, oh, Holly might have been in with Ralph. We had three offices. The

cubicle, the arrangement, down there had an entry and off to the side of it was the manager's office which started out to be a conference room but it became the manager's office shortly after.

And that was for Jim Howland?

And that was Jim's office. And then the next place was Holly's office and someone that was in with him. We had two desks in there. And then the next place had two desks in it, and that's where Archie and I were located. Then the other big area had drafting tables and a place for storing drawings and so forth; then the back was storage space and a coffee shop where the coffee was made, and had the sink and all that sort of thing. That was the arrangement of the office. A long, rectangular place with an entry at one end and the storage space at the back. No windows. Skylights but no windows. See it didn't open outside the building.

I see. So Archie Rice was then accepted into the firm? He wanted to do that more than work for the Health Department, did you say?

I think Archie was talked into it by Fred as much as anything else. It never seemed to me, when Archie first came, that he was as enthusiastic about coming as Ralph Roderick was. Ralph wanted to come. It seemed to me that maybe Archie had some reservations about coming right at first. That didn't last very long, but initially I think he had some reservations. Ralph Roderick never had any. That was the one thing that he wanted to do. No question about it.

Obviously, Archie Rice was another exceptional student of Fred's.

Oh, yes, he was. Not necessarily with the best grades. He was not like Holly. He was very smart. He was very independent. I think he was in and out of trouble a fair amount of the time. He and Fred would almost have fights over this, that and the other thing. But brilliant and extremely capable; did lots of thinking on his own. That's Archie Rice.

Fights about how a particular project goes together, or?

No, this was in school. These are things that I've heard of Fred talking about him, and how he used to derisively call him Archibald. Fred was hard on people as a teacher. Fred would move people to work by irritating them somehow.

And yet he was popular with the students?

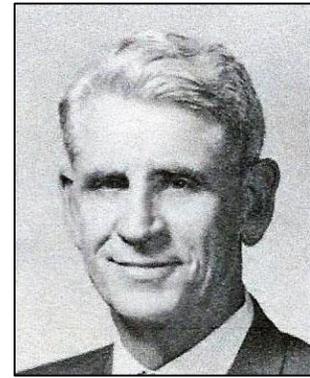
No, I don't think he really was. He was popular with them after they got out of school. I think he was very unpopular with them while they were in school.

He didn't drive or irritate people in the firm?

No, no, no. He was really quite different in the firm. Quite different in the firm.

Your recollection of Fred while you were at OSC was that he was very hard on students. Did you have any reservations about him being a part of the firm then?

He wasn't hard on me. I don't know why. I paid attention, you know, and I was trying. The people that he was hard on were the ones that he felt could do better and weren't working very hard, and he'd work on them just like you would on a draft horse. He would just belabor them, and give them a real bad time to drive them to work harder.



Fred Merryfield

I don't remember that I ever had any problems, but I was interested in... see I'd been out of school for a while—I was a lot more mature than a lot of them. I was trying a lot harder than a lot of them, I guess. I don't think he ever gave Jim or Holly any bad times. But he used to throw erasers and chalk and so forth at a lot of the other people that he would try to drive into compliance.

But he wasn't like that with the firm employees?

No, not at all. Not at all.

What was he like?

Oh, just, you know. He tried to be helpful. He was extremely enthusiastic about things and there were limited number of things that Fred could do. Fred was not a designer. Most of our efforts, our productive efforts as far as income is concerned, are all based on design. They always have been. And the analytical part has been a minor part. Fred was an analyst; he was not a designer.

Fred had another attribute which was extremely valuable, we didn't find out about it until later, but he had that attribute of looking at someone, and talking with someone for a short period of time about diverse subjects that have nothing to do with anything other than just general conversation, and when he would come out of the meeting he'd tell you all about that individual—where his strengths and where his weaknesses were.

Do you mean as pertaining to engineering?

Yes, and as a person. You know whether he was a good worker or a bad worker and where his strengths and weaknesses would be in the various technical areas and so forth. Fantastic. I've known of other people like that. The General Electric Company used to have a man who was in charge of their personnel department who could do that. Spend fifteen or twenty minutes with a man, and he could tell you all about him. And Fred could do this. Not very many people can. That's the reason why we selected him to set up the, Personnel Department, because he could do that.

Did he do the hiring?

Well, he did the reviewing. Whether we ultimately hired the individual was very often left with the guy that he was going to work for. But Fred's recommendations were very important. And if he said, "Don't hire" someone, than you had better be careful about hiring him. But the initial salary scales and things of this nature were things that Fred worked up. The scheme for evaluating people's competence was things that he and his wife worked up. They were very valuable. Still use them.

In another interview you mentioned that you remember going to his house at night and seeing them working on this employee evaluation scheme?

Yes, Mildred was a very competent person, extremely competent, and she and Fred spent hours just looking for the right word to describe some facet of an individual's personality. The reason they needed a word that everyone understood and which described things was so that you could go over this array of words and you could say, "That's what fits him" in talking about an individual—that fits him; this doesn't fit him and that doesn't fit him, but this does, you see. And then you can describe a slot that the individual fit into, and now you have a basis for putting a value on the things that he can do if you evaluate all of them.

So most of the people that he recommended to be hired, turned out to be pretty good employees then?

Yes, I don't know of anyone that he ever recommended that turned out bad. I know of a lot of people that he said, "This guy is going to be a problem to you" and we hired them, and I think we ended up having to let them go.

I understand that he talked quite a bit?

Oh, yes. Yes, he did a lot of talking. Fred had an uncanny competence to get up in front of a group of people and entertain them and talk. He liked to talk, and he did a very good job.

Was he the one then that went out to the clients and tried to convince them that your firm was the one they should hire?

Sometimes, though I don't think he did as much of that, after we opened our doors, as the rest of us did. You know, he was more involved with the university. He was on three-fourths time and that didn't leave him an awful lot of time to be running around over the country. But he had his cronies and his friends and he'd spend time with them on the weekends and so forth, and that would sort of break the ice; then Holly or Jim or I would go in and talk to them and see if we couldn't get them to let us do things.

Let me tell you a funny story; you just reminded me of something. One of the first reports that we gave was on the subject of some work that we were going to do, or proposing to do in Albany. Jim did part of this work

and I did part of it. It was the first project that I'd done for the firm, and I think the first project that Jim had done for the firm. It had to do with garbage incinerators more than anything else. At the time I wasn't registered, Jim wasn't registered, and Holly wasn't registered. The examinations for registration were given in April of the year, and we hadn't taken our examinations yet and, of course, the registration procedure wouldn't be completed until the following summer. So neither Jim nor I were registered. Fred was.

We prepared the report but Fred had to give it because he was registered. We went to this council meeting over in Albany. Fred hadn't read this report very carefully that Jim and I had written; and he forgot his glasses. Now, Fred had keen eyesight but he was very farsighted, and his arms weren't long enough to get even the headlines of the newspaper out there far enough so he could read them. So he was up there in front of the council—quite a number of people in attendance—marching back and forth giving this dissertation about something that he didn't know anything about.

Oh, no! (Laughter)

He'd hardly ever read the damn report. And finally he knew that he was getting into hot water, so he walked over to one of the councilmen who had a pair of reading glasses on, you know, this kind. And he said, "Pardon me, sir. I need these worse than you do." And he took them off. (Laughter)

Oh, you're kidding?

That's exactly what happened. And then he puts them on and then he can read the report and go on.

It's a wonder that council member didn't sock him in the nose.

I tell you, you never seen a more surprised individual than that fellow.

I hoped they liked the report.

Well, they decided not to do anything about a garbage incinerator, and I suspect they were right. But we did do the rest of the work—a rather substantial amount of work that we did over there.

He was a real character then?

Oh, he was a character, that's right.

But he didn't really have anything to do with the projects other than...

No. You know, once in a while if a very difficult technical problem would develop over a pump use or something of this nature, things that were well within his real area of expertise, we would call Fred in to help us with it. Pumps were an area in which he had a great deal of expertise and the water and waste processes were in his areas of expertise and so forth.

Incidentally, Fred and Mildred coined a clever definition of engineering—
“The bridge between science and industry.”

Did he also point out students that could possibly be potential employees?

Yes, that’s right.

He was in an ideal situation for that.

He was in an ideal spot. Yes.

Anything else about Fred? Since you’re the person who knew him the best, I want to make sure we cover him as thoroughly as possible under these circumstances.

I guess I’m not sure that I do. I think if you are looking for additional information, you might talk to his wife.

Now this is his second wife.

Yes. Mildred died while I was in Japan; it must have been in 1964. I was on a business trip over there and she died while I was gone. They had no children.

They had no children. Is there a reason for that?

Not that I know of.

I mean, did he dislike children?

Oh, he loved children and the children loved him.

He didn’t scare them off?

Well, he was good to them. He’d scare them off later. Fred was godfather to all three of our youngsters and he loved the kids. But he’d give them hell. (Chuckles) He didn’t fool around. He’d give them hell when they needed to be given hell. He did that to everyone.

But Anne might be able to contribute something that I haven’t been able to contribute. Anne came to live with the Merryfield’s after Mildred became ill. She was a student; I think she was an exchange student. She’s British. She was over here from England and I think she was studying biology or something that Fred was interested in. Mildred needed some help around the house and so, as I remember it, Anne lived in and helped Mildred; and then when she finished school here, I think she went to California and was in school. I don’t remember which school it was but if I were guessing, I’d say it was California at Berkeley. And she was studying on—I’m sure it was a PhD.

And after Mildred died, Fred was just devastated, because Mildred was his balance wheel. Mildred was the one that told Fred, “Well, now we’ve got to go home. You know, we’ve been here for five hours.” And Mildred was very patient. Fred would just talk terribly to her sometimes—embarrass the hell out of me and embarrass Billie. And Mildred would sit there and shrug it off. Fantastic person.

Somebody else who might be able to give you some inside into Fred would be his brother-in-law, Norborne Berkeley. Norborne was Mildred's younger brother, and he lived with them for a number of years, here in Corvallis. Norm taught history at Oregon State. Norb's a brilliant person. He's been in and out of schools all over the world. I don't know [where]. He's been in British schools and I'm sure he's been in other schools. He just never completely got it together.

Fred was real disturbed that Norb never finished his advanced degree. He knew much about all these subjects but he never bothered to get an advanced degree. He taught history here on this campus for a long time and retired some years ago. I think Norb is still living in town here part of the time. I'm sure he could give you better information on Fred and Mildred than probably anybody else living. I hadn't thought about that before. But I'm sure that's true.

Anne wouldn't really have that background except for what Fred might have told her. But Norb has been with Fred, you know, for fifty years. You see, the Berkeley's lived in Pendleton. As a matter of fact, [Norb's] father used to be justice of the peace in Pendleton and when I got pinched for reckless driving, when I was a senior in high school, he was the judge that I had to appear before. Fred never let me forget that—that I got pinched for reckless driving. I'm sure that Norb could tell you more about those things than anybody that I can imagine, certainly more than anybody in the office. Norborne Berkeley.

Can you talk a little more about Archie Rice? About his contributions to the firm over the years of your association with him.

Well, Archie had tremendous drive. I would guess Archie has more management competence than anybody we've ever had in the firm of any employee level. More than Jim. More than Holly. He had tremendous management know-how. Archie has an interesting viewpoint on people. He reads people like Fred. He reads people very well. He knows how to enter an argument at the right time with the right words to make his argument the winning one. He is a person who is sought after. He is a real extrovert. He has a good sense of humor. People will seek him out. They want to talk to him. He is interesting.

Now, how does this all fit in with everything? He was innovative. He was looking for better ways to do things. Very critical of the way we did things and other people did things. Sometimes he would almost wait until the last minute on a project. He'd be unhappy by the way the thing was turning out but he wouldn't know quite what to do with it and almost at the last minute you'd see him say, "You know, this isn't right and we've got to fix it, move this and do that and so forth."

And the whole damn thing would be up in the air for two or three days, and people would be working twenty-four hours a day and then when it would come down, it would be great. Just great. Very innovative. Probably

one of the most innovative people that we've had. So, his great contributions, I think, were his potential management competence and his innovativeness. I think most of our people were afraid of him as a manager. He was hard as a manager.

Someone mentioned that he had a temper.

Well, I've never seen Archie blow up. I've known him very well over the years. He and I have an undivided half interest in a piece of property down at Triangle Lake. We have mobile homes on them and have had for a long time. He's down there every weekend, and I'm down there almost every weekend in the summer. And, we've built docks, and we've had all kinds of problems with the damn thing coming apart, and I've never seen him get mad. You know, I think you've got to draw a line between getting mad and saying, "Gee, this is wrong and we've got to do it right."

He'll be very vehement about how you do it, and he scares the hell out of everybody when he does that. Archie would have made an excellent President; he'd have made an excellent Chairman of the Board; and I don't know all the reasons why this never came to pass, but I'll bet you if you could count the people on our staff and ask them to evaluate him, you would, if you read the evaluation properly, find out they were afraid of him.

He'll clean house on you, you know, if you aren't producing; he'll clean house on you. Jim will not. Jim will give you another chance and another chance and another chance and work with you and so forth. Archie will give you another chance once or twice and then you're out. But, that's a facet of business management which has lots going for it because you don't make many mistakes. At least you don't make them the second time.

Why he was never made President?

Because I think the majority of our people were afraid of him. He'd manipulate you, you know. If you wanted something, he'd start off and the first thing you'd know he'd have you agreeing with him about something that you really didn't want to agree on.

Can you give me an example?

Oh, sure. At one time we had an outfit called the General Services Company which was manufacturing Flomatcher. At the same time, we had the Pitcon Filtration Company which was doing the Microfloc process. And Archie felt that we really ought to put these two together. I was president of the General Services Company, and he was president of the Pitcon Filtration Company. He thought that we ought to put them together and because there was much more potential in the Pitcon Filtration Company than there was in the General Services Company, he wanted to run it. I never really cared that much, but I was surprised to find out, after we'd started discussing the thing, that all of the sudden I was in his camp. You

Yes. It has some problems. The biggest single problem that it has is that, invariably, since every individual is in a regional office and every individual is in a discipline, potentially every individual has two bosses which creates some problem. It's not an insurmountable problem. It can be insurmountable if people want to make it that way. I think for several years a lot of people didn't understand the system and it didn't really work very well for a while. I think it's working very well now.

And this was established in the late sixties then?

I think it was about 1970 when that was put together. Basically, when the program was finished, there were three people who were very enthusiastic—Archie and Holly and myself—real enthusiastic about the program. Most everybody else had reservations of one kind or another. I think those reservations have been decreasing as time goes on. It is not an easy system to make operate.

I can imagine. This discipline system is one of his contributions.

Yes, I think that was a major contribution that Archie made.

Can you discuss some other contributions of Archie's?

Archie is an individual in whom I have tremendous confidence. Of course, I have tremendous confidence in all of the six originals. All of them and probably no more overall in one than I had in another. But Archie was really a fantastic person; he had a good sense of humor. He was, you know, a good speaker. People couldn't help but be influenced by his confidence; they had confidence in him. He was a nice person to have around. He had a nice family; he was just a real enjoyable person to have around. I still like him; I enjoy being around him; we have a good time together.

Are you closer to him than the others?

Probably. And not because of any other reason other than the fact that he likes to be around the water and I like to be around the water. You know, years ago he had rented a lot; as a matter of fact, he had the lot rented where that trailer is showing where she missed the boat [referring to a photo on his office wall]. The people that he rented it from decided that they wanted to develop it themselves, so they didn't rent it to him anymore, and that was when I sold half of our lot to him.

I think the world of Archie. Billie likes Jane; they get along fine together. We don't see a hell of a lot of them around town; we're not with them all the time but we do have a lot of mutual interests. He loves a boat; I love a boat. He loves to fish and I don't give a damn about fishing. But in most things we have similar interests. You know, I got a Suburban and he turned around and he bought a Suburban; you see, he needed a Suburban for the same reason that I needed one. He kept saying to everyone that he was looking for a car like the one that I had and he found one almost like it, different color but it's almost the same.

But, you know, there's nothing petty or selfish or anything of that nature about Archie. If something needs to be done, why he just goes out and does it. He doesn't say, "Will you come and help me?" He just sees to it that it's done. Wonderful person to have around. Just a lot of fun. Technically he's an extremely competent individual. One of the finest managers the firm has ever had. He is smart. People are afraid of him. I've said that before and that's true.

I know there was some difference of opinion between him and Jim Howland on some things.

Oh, but there are differences of opinion between Archie and me about some things. We used to argue about a lot of things that we were trying to do. He thought that what I was doing was wrong; and some of the people that I set up to follow [up on] what I was doing, he thought that was terrible—just a terrible mistake; and we argued back and forth at great lengths. So we don't [always] agree. He doesn't agree with anyone all the time, that's neither here nor there. And I finally said, "Gee, this is the way I see it, and this is the guy that I want to have do this job." "Why," he said, walked off down the hall. (chuckles) That was it. He didn't say any more about it and never opened the subject again. But that doesn't detract from our friendship.

It's exceptional that the six of you continued to be so compatible, because, in close relationships such as yours in the firm, a lot of friendships are ruined by small, petty disagreements.

Well, you can't afford to be petty about things. And that's right. You sure ruin them when you get petty. I think you have to recognize people's strengths and weaknesses, the things you like about them and the things you don't like about them; if you decide you are going like them, you like them in spite of things you know, like you wish that he were taller or shorter or thinner or fatter or bigger feet or something like that. Those really aren't very important.

No. I agree. Sometimes it's hard to overcome pettiness, though.

Well, you know, that's one of the things that just irritates me completely. To my parents, when I grew up as a youngster, there was no basis for feeling that anybody else around was different or better or poorer or something; there was no feeling about people with other religions; there was no feeling about the Jews, or no feeling about the Negroes, or no feeling about the Mexicans; there wasn't any feeling about the Episcopalians or anybody else. They were all people. And I grew up that way. I think Jim grew up that way. And I don't know but I would be surprised if Holly and Archie and the rest of them didn't grow up that way.

Not everyone does. My wife didn't. Her family had very definite feelings about certain things: certain things were good and certain things were bad. She doesn't believe that, but some of the people in her family, boy, they used to just make my hair stand up on end. The things they'd say

about some people, some members of the family. I thought they were off their rocker sometimes but I was never brought up that way, and [the way you were brought up] makes a difference in the way you approach things at some time. I'm sure that Jim was brought up that way and I'd be surprised if all the rest of them weren't.

And that makes the difference.

I think, fundamentally you start out that way. Heck, I used to play with a bunch of Indian kids. One of the youngsters that I played with was Negro; one of the youngsters I went to high school with was Negro. It never entered my mind that there was ever a problem there.

You mentioned the same lack of bias when you were talking about women professionals being hired.

That's right. No. The only thing about the women professionals that bothers me is they act like men and that's terrible. They stand around with their hands in their pockets when they're talking and they don't look like girls, like women. And they should. They try to emulate the men and that's a mistake. They ought to be women.

You think they are trying to emulate men?

Oh, yeah. I think they probably are. I think maybe they feel in many instances, that it's easier. And they ought to be themselves.

I agree with that. I'm surprised that they are trying to emulate men.

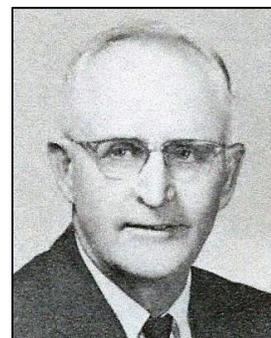
Well, that's probably not always true. But walking down the hall the other day, I saw a couple of young ladies that were both engineers and they were having a discussion, you know, and they were leaning against the wall. They had their hands in their pockets and, except for their hair, they looked like a couple of men, and I thought, "Gee, that's too bad." (Chuckles) "That's too bad. They look so much better being themselves than trying to look like somebody else."

Maybe they felt like they were being themselves.

Maybe they were.

I'd like you to talk about the contributions of Ralph Roderick. You mentioned much earlier that he was not recognized for many things.

Well, it always seemed to me that Ralph was responsible for a lot of the wastewater projects that we were able to bring in. He developed the work, made the contact with the people that had the problem, cultivated them, and sold them on using our services. He acted, essentially, as the project manager, saw to it that the project was delivered



Ralph Roderick

and that the client was satisfied; and he did that in a number of projects which got us into the sizable project area.

The first one that he got into was in Eugene. Eugene was a fairly good-size city; it was the second largest city in Oregon, and they had a significant problem, Ralph was able to convince the city fathers in Eugene that they ought to use our services, and he was suggesting things which were quite a wide departure from what their thinking had been—moving the plant way downstream so it could serve a larger area and things of that nature which were expensive but in the long run were to prove very beneficial.

You know, Ralph was really quite an innovator. He couldn't see any reason why we couldn't use a different style of pump in those plants than we had used in the past. No one had ever used them in the country. No one would say you couldn't use them but no one would say that you could either. And I remember a meeting that he asked me to go to in Eugene with the City Council in which he made a masterful presentation saying, you know, "I can't guarantee that this will work, but we'd like to try it and if it will work, it'll save you a lot of money. If it doesn't work, then we've got some problems that we'll have to face up to." And they bought the concept, and the concept worked real well.

Weren't you involved in that Eugene project? Didn't you develop your Flomatcher?

Well, that was a different part of the project. But I was involved in it because of Ralph. It was Ralph's, you know Ralph was the contact with the city of Eugene, and they had a whole host of problems, one of which was this pumping station where we developed the Flomatcher. Ralph was the one that came in with that problem. He didn't know how to solve it, but he recognized that there were solutions, and he was a great person for recognizing problems and getting the right person to work on those problems so that they could be solved.

Why did you say that he wasn't recognized for some of these things?

Well, when you go back over the things that have been done, the people who you immediately think of are Jim and Holly and Earl Reynolds and Harlan Moyer because they are the people who have been the business leaders of the firm, you see. And you don't see other people who have made significant contributions, because they aren't visible like the firm leaders are visible.

And so it's always seemed to me that people like Ralph, really, have not gotten... I tend to feel that, if you take Ralph out of the circuit and didn't replace him with someone who could do the same things that he could do, we wouldn't be where we are today. Now, I could say that of several people, too. It's true of Archie. It's true of Jim. It's true of Holly. I think it's probably true of me. And it's true of others. True of Earl Reynolds. It's

true of Harlan Moyer and Clair Hill and a number of other people. But it is certainly true of Ralph and not very many people realize it.

Also, he was involved in that Lake Tahoe project.

Well, he was the one who said, "I think we have a process which can be used there." Nobody agreed with him originally.

Do you remember that debate in the Board Meeting?

Well, not that debate. The subject came up a number of times and we discussed it. And the problem, I think, was that it hadn't been done. Ralph was saying that it could be done and basically I think others were saying that it hadn't been done, and therefore it wasn't applicable. But Ralph was adamant. And there were a number of concepts that had to be developed that made the project real difficult; but doable. Doable probably because somebody had the drive to see that it was done and that was Ralph.

Yes, I think the firm owes him a tremendous amount that has never really been publicly recognized. He was the one that developed the first sizable projects for the firm. He got us into the larger projects with Eugene and Salem and people like that. He was the one, you know, that said "Gee, we can apply this technology to advanced water waste treatment and do the job" that was done down in Lake Tahoe. And basically, he was the one that made the contact with Clair Hill and Associates.

Tell me about that.

Well, I don't know too much about that. You'd have to talk to Ralph about that I think. But basically Clair's organization was in an area where there was a lot of development, and they had a lot of problems, and Clair had a lot of opportunities to do pumping stations and plants of one kind or another for various clients: but he didn't have the people who could do all of the work that had to be done. And I can't tell you how Ralph started doing the work for Clair Hill and Associates, but he did. He wasn't necessarily the first one that knew Clair Hill; I don't really know who that was. But it seemed to me that Ralph was the one who developed that work with him.

He developed the work at Lake Tahoe, and he developed a lot of work, smaller work, before that time; and I think it was because of Ralph that Clair had confidence in what we could do. It certainly wasn't because of me, because I really had very, very little contact with them. And I really don't think that most of our other people had much contact with them. I think Holly was in Seattle and Jim was busy with other things. I think that was just something that Ralph took on his own.

So it was Clair Hill and Associates working with people like Ralph Roderick that eventually led to this merger? They had confidence in your firm, that's why they didn't choose to go to some other place?

That's right. At one time, Ralph was toying with the idea of merging four firms—CH2M, Clair Hill and Associates, Boyle Engineering, which had offices in Los Angeles, and a major soils group that had offices in Palo Alto. Their name escapes me at the moment; I may think of it later. Anyway, I think Ralph—and I think Jim was in on some of those discussions—held several discussions with representatives of these various firms and they expressed any interest but they didn't really go much further than that. But he and Jim were able to put together the merger with Clair Hill after that. I can't remember precisely when all these things happened. While the Tahoe project was underway, I think the two firms were separate. I don't think the merger took place until after the Tahoe project, essentially, was complete. [phone rings, taping is stopped and started again]

You said...

I've lost my train of thought. Anyway, I believe you owe everyone in the organization something—everyone there [CH2M HILL] has had some part to play in its success and in its problems and so forth. Some people get a lot of credit; others don't get any credit at all. But one person, that I think deserves a lot of credit, and whether he's gotten recognized for it or not is beside the point, is Ralph Roderick.

For example, probably the one big thing that was a very important point in the growth of the firm was the development of this plant down on the California/Nevada border at Tahoe. And the only reason we ever got into that was one of the people, Archie Rice, developed a process for handling water—just water. Microfloc. And Ralph Roderick came around and he said, "Gee, there's got to be a way of applying that to wastewater." He and Archie used to have great arguments. I can remember that argument. Archie said that we have nothing to sell. "We have nothing to sell." And Ralph wouldn't believe it, and he kept pushing. He wasn't able, technically, to put it together but he said "I know it can be done."

And he was the one that pushed the thing along and led it and got the people involved and so forth, and really was as responsible as anyone could be for getting that Tahoe plant built. Now stemming from that a whole host of things have happened. But if it hadn't of been for Ralph, that plant would never have been built. If it hadn't of been for Archie, it wouldn't have been either because the technology was Archie's. But the driving force, said, "Gee, we can apply what you know about water to waste," was Ralph Roderick and no one else. He was the one. We had nothing but problems with that thing. You know, it didn't work: it would work when we had our people there, and it wouldn't work when we had the district's people there, and we just had nothing but problems with it. And the guy that just refused to give up and said, "Gee, there's got to be a way of getting around this" and so forth was Ralph Roderick. It wasn't anybody else. It was Ralph.

It was Archie Rice who developed the Microfloc process but it was Ralph Roderick who said it should be applied to the Lake Tahoe project and nobody else thought that it could work there?

Well, you know, most of us... I didn't know because that's not my field; and I don't think Jim or Holly knew; and I can't remember how Fred Merryfield expressed himself. As I remember it in the partner meetings, the big discussion was between Ralph and Archie. Archie's feeling, and what he said, was "We have nothing to sell." And Ralph was arguing the other side that this was something that we could apply; and it was a heck of a job but he did it. Through the help of a lot of people, a whole lot of very capable people, he made it work. But he was the driving force behind it. That's the point that I wanted to make.

He was just optimistic or just very positive it could work?

He just wouldn't give up. That type of arrangement.

Was that typical of Ralph Roderick?

Of Ralph? Oh, yes, pretty much. Yeah, he was a great driver. Ralph was the project manager for almost all of the wastewater plants that we built in the early days. He was the one that got the jobs; he was the one that managed them; he held the hands of the client; he satisfied their requirements which are not easy—very difficult with a public agency to keep them happy with everything that is going on. And Ralph has that easy way, you know: when people get excited, Ralph would say, "Well, now, we'll work this out." People had confidence in what he'd say, just like Holly. Ralph was great; the firm owes him a lot. If it hadn't of been for Ralph, a lot of things would have been different. We would not have been nearly as far down the road as we are.

You called him a great driver and an innovator. Did he apply these qualities to other projects?

Oh, yes. Yes, I think so. One of the developments that's credited to me, the Flomatcher, was developed only because of Ralph's insistence. It was my technology; it was Ralph's drive, you see. He came in one day, his office used to be fairly close to mine, and he came in one day and he said, "We have a problem over in Eugene. We need to develop a variable speed pump. How can we do this?" I couldn't answer that right at the moment because there wasn't any obvious way that it could be done, but after subsequent conversations about it and so forth, we found that there really were several ways in which it could be done. We selected one and developed it. That became the Flomatcher. But the insistence that something needed to be done came from Ralph.

He saw the problem and the technicians solved it?

He saw the problem but he didn't know how to solve it. He just knew there was a problem there, and he was confident that somebody could make it work, you see. And this was true of so many things, many things

that I'm sure I'm not even familiar with. He was a great driver. I think he was largely responsible for a lot of the early success that the firm had in the sanitary area.

Was he more confident and insistent than the rest of you?

Well, to Ralph, nothing was impossible. Some things were a little harder than others but nothing was impossible. I think most of the rest of us were probably better technologists than Ralph was. We could see reasons why it couldn't be done, you know. Why you can't do this because . . . Well maybe that's not true; you know, maybe there's a way to get around it. Maybe not as easy but there's a way of getting around it. Ralph would just never admit that there wasn't a way around it.

He obviously had great faith in your abilities then?

Yes, I suppose so. He was great, a great person. The firm owes him a great deal. There is really no way in which those things can be recognized for everyone, and that doesn't bother him. The lack of recognition, if there is a problem there, that doesn't bother Ralph. If it does, he's never let anybody know it.

He seems to be enjoying his retirement.

Oh, I'm sure he is. Yes. The loss of his grandson, of course, was a disaster, and Mary's not being able to get around as well as she used to is also a problem for him. I don't know if he plays golf as much as he used to. I haven't seen him as often as I used to.

Is that because you're both busy?

Probably. I'm down here half the time or maybe a little better and gone part of the time. We just don't get together as often as we probably should.

MERGER WITH CLAIR HILL AND ASSOCIATES

How well did you know Clair Hill?

Well, over the years, I got to know him pretty well. We were involved as technical experts for the Pacific Gas and Electric Company in a lawsuit that they had with a public agency near Redding, and I believe the reason that PG&E selected us was because of Clair's suggestion or recommendation. I'm not absolutely sure of that but I think that's true. And I think probably that was when I first got to know him reasonably well. Then I was in and out of their offices fairly frequently from that time on. That probably was in the late fifties some time.



Clair Hill

Oh, that early? Can we talk about Clair Hill's contributions to the firm after the two firms merged?

Oh, Clair was extremely well-known in California. He was a member of the California Chamber of Commerce, and he was a very influential person in their water affairs. Water is a critical item in California. Clair was a recognized authority on the subject and was someone that the state officials consulted frequently about their water problems, so he was well known. He knew the officials in the Pacific Gas and Electric Company, and he knew the officials in most of the northern California communities.

I don't know how well he was known south of the Tehachapi's, you know, in the southern California area. But in northern California he was very well-known. So his name alone, without any other contribution, was extremely valuable to anyone who could use it; his contributions, in the California area, were real important as far as getting started was concerned. Through Clair and the people that Clair knew, the name CH2M was relatively easily transferred from the Northwest into the Southwest, basically into northern California.

That's why the "HILL" was attached to CH2M?

No, I don't think so. I think the real reason why the "HILL" was attached to CH2M was that it was a merger of the two firms, and the CH2M was the larger firm. The corporate offices were going to be in Corvallis rather than in Redding, and we felt that there couldn't help but be some concern on the part of the Hill people that they might be mistreated by the larger partner; and as a means of solving any problems of that kind that might come up, we tried to indicate that the merger was a merger, and not a takeover, by attaching a part of their name to our name.

Normally, when you put together a merger of that kind, the succeeding company will put in people at the management level who, wherever they



CH2M HILL Logo #1

get them, manage the way that the succeeding company operates, but we left the organization of the Redding office essentially unchanged. There were differences in the way the two companies operated. There were differences in philosophy about how the offices should be run. There were differences in philosophies about a whole host of things. They used airplanes a great deal in their movement. CH2M didn't. We didn't have an airplane. We weren't about to buy one. We used commercial air transport, and we drove automobiles. And the Hill organization used airplanes to go almost every place. Clair was a pilot and I think most of his better engineers were pilots.



The Clair Hill Air Force.

He was very involved in aerial photography, wasn't he?

Oh, yes. He was in the surveying business and in the aerial photography business. That's right. That was the central part of his efforts. That's right.

How was this problem resolved about adding more names as you acquired the Florida firm and the one in Washington?

Well, we decided... Actually, we decided that that really wasn't necessary. It was complicating. It precluded, in many instances, a continuation of a well-known name to be changing it all the time. So we decided after that one time that we wouldn't make any other changes in it.

How did you feel about adding the "HILL" to CH2M?

Oh... I could see... there were certain advantages; there were certain disadvantages. I guess I didn't feel very strongly about it. Jim felt very strongly about it. And I think Archie felt strongly about adding it. I don't think anybody else did. I think more than anybody else, Jim probably was the one that said, "I think this is what we need to do." Jim was particularly interested in adding it because he felt that that was a part of the things that we had to do to integrate the two organizations and to make those people feel at home. And, I think anybody looking at it could add up advantages on one side and disadvantages on the other because there were obvious problems to doing it. We had to change a lot of format and stationery and things of this nature; but those are really fairly minor; I don't think they created any problems.

THE CH2M PARTNERSHIP

This question of name change came up much, much earlier when Rice and Roderick joined the firm as to whether you should add the "R2."

Well, that's right. But you know, I don't really think that was ever done seriously. The CH2M was not our idea. The CH2M came from the Eugene Water and Electric Board, one of our clients. I know that's where it came from because the chief engineer of the Eugene Water and Electric Board wrote me a note. We were working for them at the time; we were designing the Walterville hydroelectric plant for Eugene Water and Electric Board and our offices were downtown over what is now the Rexall Drugstore. The chief engineer wrote me a note one day and he said, "That name of your is too long and involved and I'm going to shorten it." And he addressed this to CH2M, Rennie Building, 212 Rennie Building I think was the address, Corvallis, Oregon. Of course, it was delivered because of the address, and so that's where the CH2M came from. It was his idea.

And you liked it?

Yes. We thought, gee, that's kind of clever. And so for a long time we used the CH2M in conjunction with Cornell, Howland, Hayes and Merryfield. As a matter of fact, the original logo looked like a kind of a Chevrolet sign with the CH2M in one part and the Cornell, Howland, Hayes and Merryfield in another, and that persisted in one form or another up until about 1970. Persisted for a long time, twenty years.

One way or another we kept both names; I think the corporate name was Cornell, Howland, Hayes and Merryfield almost up until the merger with Clair Hill and Associates. When Archie Rice and Ralph Roderick became junior partners, there were four partners each having twenty-five percent of the ownership; and then after we added the other two, they came in with a fifth of the ownership together. You see, each of us had a fifth and they together had a fifth so that they had half the ownership that we had originally, and basically they were junior partners.

And at that time in a partner meeting we did talk about the possibility of changing the name from CH2M to CH2MR2 but I don't think that discussion lasted five minutes. It was kind of kicked around as something that was amusing and fun, and when Earl Reynolds became a partner, sort of in jest, about making it R3. But nothing was ever done, and I think the name doesn't make much difference whether you call it the Acme Engineering Company or something else. Once the name is established, you'd better leave it alone. And so that's why I think no one really planned on extending the name seriously, though we did talk about it.

Well the CH2M fits. It has a nice sound to it.

Yes, it fits. If the "M" was in the middle, it wouldn't work.

That's true.

You know, a thing like that has to have some passive sounds like the "C's" and the "S's," and it has to have some staccato sounds like a "T" or a "G" or something. And the "CH," the "2," is where you get the staccato note in it; without that, it's passive. It's like calling "GM" which has a staccato note on it something like "SM." It just doesn't have it without the staccato note. So that choice is just one of those things. But there is no doubt in my mind, that the CH2M was generated by the chief engineer of the Eugene Water and Electric Board.

In the archives there was some reference to Archie Rice having thought of the name while playing a game.

Well, you know, it's entirely possible that those things can almost simultaneously, came from several different sources. But my recollection is that I got this note from the chief engineer in Eugene. This note said, "Your name is too long and involved and I'm going to shorten it."

Who was it that wrote the note?

It's been a long time since... I'll have to think about it. Hugh Currin.

How did you decide that Archie Rice and Ralph Roderick should become partners? Didn't you think four was enough? Did you want to cut the pie further, or was there some reluctance on some people's part?

No. I don't think there was any reluctance. I think all of the four of us realized that we had two very valuable and very strong people, and that if you were going to let them reach their full potential, or maybe even keep them permanently, you had to make them a part of the organization; and that the organization would be better and stronger and so forth if they were a part of it. And that's the reason for it. I remember no reticence on the part of anyone towards bringing them in.

Wasn't it rather unusual to have four leaders? For example, didn't Clair Hill have sole proprietorship of his organization?

Well, maybe, that's not quite true. I believe that I had the feeling that he was in the throes of making some changes in his ownership. But I really don't know that.

But that came much later, whereas, this was a couple of years after you had started the firm.

Well, at that time, Clair didn't have anyone in his organization that even approached the ability of Archie Rice or Ralph Roderick. They're remarkable people.

When Archie went with the Neptune Meter Company, when we sold the Flomatcher process to them, he went with an employment contract for five years, I think it was. And at the end of that time, or near the end of that time, I believe he was offered the opportunity to become the executive vice-president of Neptune. Now Neptune was a pretty good-sized company. You know, it's on the New York Stock Exchange; its stock

has been traded for years. It's a well-known company. It was a company that was heavily endowed with family interests; the family had sort of run the company and had been the manager and the general manager and the president and the chairman of the board and so forth for years.

For them to bring anybody else in was really quite a step, and yet they wanted him very much. I don't blame them. They needed him. That's the kind of a person we're talking about; you don't find them very often. I guess I'm inclined to think that it was rather wise on our part to recognize that we had people of that kind of stature and that it was to our best interest to bring them into the organization.

Would you say the same then of the next six partners that you invited?

Well. Not at that time. I think, you know, people develop into certain stature over a period of time. And at the time the next three or the next four came in, they certainly did not even approach the stature that Archie Rice or Ralph Roderick had. They didn't have the maturity. They hadn't had the opportunities. It's real difficult to compare Joe Lewis with Cassius Clay, you know. They are forty years apart. And so that kind of a comparison is really meaningless.

Well, I am wondering if you could apply the same reasoning when you included the last six men as partners—you brought them in because they were exceptional engineers and you wanted them to stay with the firm?

Yes. I'm not too sure about the hierarchy here but it was Jim's philosophy basically that in order to motivate people and get them to produce their best, that you had to give them certain things. You had to give them a share of the profits and you had to give them a share in the ownership and things of this nature.

And that program we started early on at his insistence. Sharing a general bonus for all of the people for example, and a Key Employee Bonus, or a partner's share, for the partners—the senior partners and the junior partners—and that was as a means of motivating people. And so, you know, almost as soon as we took in Rice and Roderick, we were thinking about who's the next that we're going to take in. I don't remember how many years it was. It was several years after Rice and Roderick came in as junior partners before we brought in Earl Reynolds over in Boise, I would guess it was five or six years after Rice and Roderick came in in Earl.

And it was not too long after that that we brought in a triad. That would be Sid Lasswell, Bob Adams, and Wayne Phillips. And then not too long after that we brought in two more—Fred Harem and Bill Watters. And that brought the number of people to twelve—six senior partners and six junior partners. And that's where it sat for a while. Then as other names were suggested, they were rejected. "No, we don't want to do that. We don't want to add to the size of the family. It's getting difficult to manage." And

that's when we started talking about the possibility of converting from a partnership to a corporation and making them stockholders.

Who started talking about becoming a corporation?

Oh, Archie was probably more responsible than anyone else. We had a problem. You know, you couldn't just keep adding partners. That was the problem. You just simply couldn't do that. Because, you know, the partners were essentially all like in a family. When you get the family up to a certain size, then you have more problems. If the people were just stockholders, it was a much less personal thing and was easier to arrange. And I think Archie was the one that was principally responsible for that concept.

During these partners meetings, how were conflicts resolved?

Do you mean threaten to get up and walk out?

Yes.

No, no one ever threatened to get up and walk out.

Well, it seems at least the original six were pretty strong-willed individuals, and it's amazing that you kept together and headed in the same direction.

Well, I think, presuming that the suggestion that someone makes isn't just so terrible that it's catastrophic, you can sit down with a group of reasonable people and discuss an issue and then come to a conclusion.

Well, one hopes for that.

If you can't do that, then your people are not reasonable or, you have a decision which threatens to be catastrophic. Maybe we were lucky. We didn't have any catastrophic decisions at that time. We had some very important ones that we had to make, and there was not always agreement. Jim was the general manager and Jim would have suggestions as to what we ought to do, and very often he would have to go back and rework them. Rework his suggestion, change it and so forth in order to satisfy everyone.

Did he dominate the meetings?

No, he led the meetings like a chairman.

Did anybody dominate?

No, I really don't think that anyone dominated them. He led them as a chairman: he prepared the agenda; he went from subject to subject. But I don't think anybody ever tried to dominate. Basically, everyone wanted it to work, and when everyone wants it to work, it'll work. They were a bunch of reasonable people. While someone would come up with a suggestion that not everyone would like, if the suggestion had merit it would be discussed objectively and then a decision was made. And I think there were very, very few votes... as a matter of fact, I can't think of any that were not unanimous.

Is that right?

And, I think it's true that, in general, it appeared that they weren't unanimous or going to be unanimous, Jim would take the thing back and work it over until it was.

So you all had common goals?

Pretty much, sure. Everyone wanted it to work.

That's amazing.

Well, I don't really think it's that surprising.

So many businesses fold perhaps because of personality conflicts, or differences in goals, or...?

Sure, that's right. But that's just because somebody is too selfish to subvert his thoughts, you know, for the common good. And I think the individual, in all honesty, really knows when he is doing that—in most instances. Once in a while, you can come up to something which threatens to be catastrophic. One individual will think that if we do this, this is absolutely the end. Now when you get to that point, then you may have a disagreement which would lead to disbanding the organization; but we didn't have any of those. Maybe we were fortunate. But I think for most of the decisions, you can present the various facets and discuss them objectively and come to a conclusion.

Do you remember discussing the goals and philosophy of your fledgling firm?

Oh sure. Yes, when we used to try to write them out and keep track of them and change them from time to time and so forth. And they always obviously revolved around making a profit—compensating the individual in the various ways that the individual needed to be compensated, by giving him recognition and paying him the kind of money that he needed to have, and providing working conditions which were pleasant and things of this nature. You know, these were basically the objectives that we had. I think our objectives were reasonably high. We never gave any thought to the possibility of increasing our profit by doing something that wasn't right; that was something that no one ever even gave any consideration to.

You're all pretty honest, then?

I think so. You know, for years, this outfit was operated on the basis of you keep your own time sheet, you keep your own expense account; and if one of the employees mistreated their expense account, why, gee, this was something that everyone was terribly disappointed in and usually those people, I think, left the firm. Usually, when you have someone who would do that, he was doing other things, too, at the same time. You would never let anyone go just because he mistreated his expense account, but that was an indication of other things that were wrong.

Why would clients come to you over some other firm that had more experience in those early years particularly?

They didn't. We went to them.

Well who was most aggressive about seeking out these clients? Was there one individual?

Oh, I think everyone was aggressive. I think all the people in the organization were aggressive. And there are a lot of people, you know, who have played parts that never can be recognized.

I remember one job that we wanted to do was in Pendleton—the waste system in Pendleton. Pendleton had had an engineering firm from Portland that had done their work from, oh, Lord; they'd done their work since 1910 or something like that. No one ever got to do any of the waste work in Pendleton except this one firm. They had a contract for making a study of the system, this must have been 1950 or thereabouts that I'm talking about, and what the engineer was proposing to do really was not in the best interest of Pendleton. He wasn't thinking far enough ahead.

Fred Merryfield's wife had come from Pendleton, and I had come from Pendleton. Now Fred is a college professor and you wouldn't expect him to be out there with a hard-nosed selling operation, but Fred said to me one day, "Let's go up to Pendleton, and see if we can't get that job."

So, we went up there and Fred made contact with one of the council members who was a contractor and who disagreed with what this engineer was proposing to do as not being farsighted enough and so forth. We had a number of meetings with this guy, and some meetings with some of the other members of the city government up there and then it turned out that one of the problems that we were going to have was my father, because he was city engineer.

And Dad said, "Well, that job doesn't mean that much to me, I'll just resign. I'd just as soon go work for the county anyway." So he resigned and took on the job of county engineer for Umatilla County and that got him out of the way so that we didn't have that problem. Now, that's something that probably very few people have ever recognized; but, if he'd been unwilling to resign, there was no way that we could get that job with me being in the way.

Conflict of interest, you mean?

Because of the conflict of interest. So, you know, we really owed Dad quite a bit as far as that job was concerned. I thought that was really leaning over backwards as far as he was concerned.

He must have had a deep respect for you and your new firm?

Well, he was quite a person, really. And, gee, the first thing you know, why these other people are out, and we're in. And then Ralph and Archie took over the job, and they did the design and basically did the project. I

think Archie did most of the analysis and Ralph did the design—located a new plant site way down the river to give opportunities for the city to grow, same thing that they did over in Eugene, and so forth.

But the hard sell was Fred Merryfield. If it hadn't have been for Fred, I don't think we'd have ever tried to take that job away from the other people. That's basically where our work came from. The early work came from Fred's friends, people that were not happy with the kind of work that they had done in past years, and they relied on Fred's suggestions as to things that they needed to do—little things. He had knowledge of where the problems were and between Ralph and Archie and Jim and Holly and myself, we went out and brought in the work. But people didn't come to us.

Until later?

People still don't come to us very often. Once in a while they do on a repeat job, but usually we have to cultivate somebody. We have to beat the bushes and go out and introduce ourselves and put our best foot forward and do something, you know, to make them want to have us do their work.

Did you have many failures in those early years?

No, I don't think so. I don't think we had any. We had problems.

That's quite a record.

But I don't think we had any failures. I don't think we've ever had any failures.

Do you think the others would agree?

You mean the others being here in the firm? Oh, probably not, but then it all depends on what you consider to be a failure. I can think of a lot of instances in which we have clients who are not completely happy with us. And I can think of a lot of cases in which our operations have not been perfect; they could have been improved and so forth. I don't call that a failure. I call it a failure when it's a complete fiasco, where you're just dead wrong.

We have had instances where we've been sued by one or two lumber companies, and I think we've got people around who consider that as a failure. I don't consider it a failure because I really don't think that we were that wrong. I think that we did some things that were a long ways from being perfect. Many of the things that we did, we did because we were naive, because we believed things that other people, the owner in many instances, had told us without researching them to find out whether this is really true and so forth. But I don't really consider them to be failures. They aren't things that I'm ashamed of.

Well, I'm sure most companies couldn't say that.

So, maybe my interpretation of the meaning of the word failure is different from some others. But I don't know of any jobs that we've had which I would consider as failures. I'm sure that if you looked at every one of them in complete detail, you'd find that they were something less than perfect.

I'm sure that you could say that about anything. Everything needs improvement probably. What would you consider some of the most difficult times for the firm?

Oh, we had a difficult time when we decided to buy this lot and build the building. That was a hard decision.

That would be where to put it or...?

No, we looked around and there weren't very many lots that were available. This one was. It was a hard decision to come up with the courage to make the decision to buy the land and put up the building. I think that was a hard decision to make. Jim and Archie guided that more than anyone else. I think Holly and Ralph and I really sat on the sidelines and those two really—Jim probably more than anyone else, but assisted by Archie—really put this building together—the original part of it. And I think that was a difficult decision.

We had trouble with the banks initially, just getting operating capital. You know capital to operate by. We had no line of credit, and so it was difficult for us to work out an agreement with the bank that made it easy and pleasant for us to do business.

For a long time, you know, we sometimes wouldn't be able to pay ourselves on the first of the month. We'd pay all the employees—we always did that—but in the early days we sometimes couldn't pay ourselves until some of the receipts started coming in from the prior month; this was fairly common, as a matter of fact, in the first few years of operation.

And the reason for it was the lack of a line of credit at a bank. Now, I don't really know who it was that made the arrangements with the Benton County Bank or whatever the name of it was; it was later taken over by the First National Bank. But somebody here sat down with the president of the Benton County Bank, it's where the Night Deposit is now, and they extended us some kind of a line of credit and from that time on, after they became owned by the First National Bank, those conditions changed and improved and so forth. Now, I don't know who that individual was. I have the feeling it was Jim, but I'm not really sure. But the early days, before we had those arrangements, was a very, very difficult time. That was a real problem.

I think probably a difficult problem was when we changed from a partnership to a corporation. That took a lot of soul-searching and so forth. We made a study and came to the conclusion that if you evaluated

everything in terms of that time, it didn't make any difference whether you decided just to keep the ownership amongst the twelve and when you ran your string and everyone wanted to retire, you just closed the doors, cause you really didn't have that much to sell—maybe a building and maybe a few desks and so forth, but you really didn't have very much to sell; most of the things that you had to sell were services.

As of the date that the decision was made, there was little to choose from [whether] you took all those profits and kept them yourselves and, when you wanted to close up, you just closed up and gave the business away, or, if you distributed the profits more widely and built an organization which had longevity so, at the time that you wanted to retire, you had something worthwhile to sell to someone who would continue in the business.

And, basically, I believe, everyone decided that they would much rather participate in something that had some longevity and build something for the future rather than just hang on to it with the idea in mind of just closing the doors. A lot of businesses have gone the other way, and, it's hard for me to say that they're wrong because if that's the philosophy that they wanted to pursue, why, as of the time that they made the decision, I suspect that their decision was right.

You make a decision at year-one that you are going to do something; now if you are to reevaluate that decision in year-ten, you might come up with a different answer, you see; and it's not fair to compare those two. But, looking at it from the time that the decision was made, it really didn't make much difference which way we went. And after we thought about it and decided what we wanted to do, I think everyone was enthusiastic about incorporating.

Was it personally a difficult decision?

Well, it was. Yes, it was difficult until we had all the information out on the table. As soon as we had the information out on the table, I think everyone examined the information and said, "Gee, I think this is the logical thing to do." And everybody agreed. But, to make the decision without all the information was not easy, and that's where we were when we started; we didn't have the information. I think Archie probably collected as much of that data and the reasoning and so forth as anyone.

There are a couple of booklets in the archives during that period in the early sixties when you were thinking about incorporating, and there are letters from lawyers and other people. I'm sure it was very difficult. You finally incorporated in 1965.

I can't remember...Yes, that's about when it was, but I don't remember precisely. We incorporated after we brought in Harem and Watters as junior partners.

Was it a difficult time when you were trying to decide whether to merge with Clair Hill and Associates?

Well, as I recall, the prime mover on that sort of a thing was Ralph Roderick. I think Ralph went down to California and had the meetings with Boyle Engineering, and—Wahler was the name of the soils firm; it is quite a well-known, not a very large, but quite a well-known foundation engineering and soils mechanics firm in Palo Alto. Ralph was interested in that because he saw it as a means of expanding our services into the California area. And without that, getting into the California area was extremely difficult. Damn near impossible, really because this is one of the most populous states in the country, and the people in California aren't going to buy any of their services from Oregon, particularly Corvallis, Oregon.

Where's Corvallis, you see. Why it might be a little bit easier. If you were from Portland, but they're not going to buy anything from Corvallis. They aren't going to buy very much from Seattle. They'll buy something from New York. They'll buy something from Chicago. But when you come from Corvallis, you've got three or four counts against you before you even start. And Ralph recognized that. I think the rest of us recognized that.

We talked some about opening an office in San Francisco. After we opened the one in Seattle, I believe in about 1960—I think that's when Holly went up there and opened that one—we talked about opening an office in San Francisco, and in Los Angeles. We hired a lawyer from Portland to go down and take a look at the two opportunities. Ray Kell was the lawyer who went down and looked at them. But we didn't do anything about it because it was really quite a problem to get something done.

That was a whole new market. We could respond to the market in Oregon; it was harder for us to respond to the market in Washington because it was a different kind of a market; it was far more difficult to respond to the market in California. And so, because we weren't able, really, to respond to the market satisfactorily, I think that's the reason why Ralph had the grand idea of joining the four firms together. That would be Wahler and Hill and Boyle and CH2M. I think they had several meetings concerning it and several objective meetings. I think Jim was down there and talked about it some. I don't know if Holly and Archie participated in it or not. I think Ralph and Jim were the ones that pursued it mostly. And in the final analysis, why we pursued it with the Hill firm only.

REFLECTIONS, CONTRIBUTIONS OF HAYES, AND THE PLACE OF COMPUTERS

Looking back, what were some of the highlights in working with the firm?

Oh, you know, that's probably more difficult to come up with. I think every job that we acquired and every job that we finished in the early days was a highlight. The first job that I can think of, of any importance, was a five-million-gallon reservoir in Forest Grove that Holly did. I think that was a highlight because that was an important job and a big job for us. The water treatment plant in Forest Grove that Archie Rice did, I think that was a highlight. You know, there are a whole host of them along the line. The Eugene plant that Ralph put together was a highlight.

What was a highlight for you personally?

Well, you know, we worked on these things as a team and if Ralph had some success, I enjoyed the success because he was enjoying it. It was a team effort.

One person would lead it like Ralph led the effort to get the Eugene work. I led the effort to get the Eugene Water and Electric Board work. Archie led the effort to do some of the early water and industrial work and he did the work in Forest Grove on the water treatment plant there. Different people led it. Of course, Jim led the whole thing because he was the general manager. But, when Archie had a success, we reveled in the fact that he had a success.

And I think everybody felt the same way about it. I think they still do. Maybe to a lesser degree because people don't know their counterparts as well now as they did when we were smaller and saw everybody every day and, you know, knew what color shirt he was wearing and whether his tie matched and so forth. Things have changed in that respect. But I think certainly in those days, everybody reveled in everybody else's success and enjoyed the other person's success.

Can you think of any highlights that stand out particularly, like the Lake Tahoe project, or others?

Well, that went on over a long period of time really, and that certainly was one, but that doesn't really stand out in my mind any more than some of the others. You know, one of the early projects that we had was the Waltherville project—a little hydroelectric project for the Eugene Water and Electric Board and, gee, that stands out in my mind as a landmark.

Why does the Waltherville project particularly stand out as a landmark?

Well, it was the first hydroelectric project that we had done. Actually, it was one of the first large projects that we had to do; it was probably of greater magnitude than any project that we had done up to that time. And it was a hydroelectric project and that made it of special interest to me.

Because you were the primary person.

Well, I wasn't the primary person. Holly was really the primary person because the biggest problem that we had was structural. I did the hydraulic design but the structural part was all under Holly's wing; he did most of that. I did the siphons. I did an important part of it. There were some innovations in there that I've always been real proud of, and so forth, but the guy that was really in charge of the work was Holly because the big dollar amount was in the structural, not in the hydraulic design, or in the siphons, or in anything like that. That was in the late 1940s or early 1950s—1948, 1949, 1950, I think would be the times that we worked on it.

How about you're Flomatcher and the Microfloc as being highlights in your career?

They're landmarks, but they don't stand out any more than a whole lot of other things. You know, they all mesh together: the Salem plant, the Eugene plant, the Pendleton plant, and the various things that we did up in Washington. Each one of them was, in their way, important and a landmark.

I suppose it is all part of a process. Projects don't happen in isolation. For example, opening the office in Boise or in Seattle, it was part of a process of success and expansion?

No, those things [opening the office] don't really stand out to my way of thinking, I guess as much as the jobs that we got. Basically, the most important thing that we have are the projects that we work on. They are more important than the offices and the disciplines and so forth. It's the project that's really fundamental. And I think where we really get our kicks is in bringing them in and successfully completing them.

At what point did you think that the firm was finally on a solid enough financial footing to continue on and survive?

Oh, I'm inclined to think that I always had confidence that it was going to survive and succeed. It was difficult early on. Sometimes you would wake up in the middle of the night and you would wonder, gee, what jobs are we going to have that are going to keep people busy two months from now. But, then you'd go back to sleep and the next morning why you'd come back down to the office and you'd get down to work and... I think everyone had confidence. I'm not sure that there was anyone that felt that there was a possibility that it wouldn't succeed. I think we all thought it would succeed.

So there wasn't some time, for instance, after a specific project, when you felt, "We've finally made it"?

No. After a project of that kind, when you'd acquire a project like the Eugene project, when you first brought that in, then you'd feel that way. Whew! Now we're on our way. But after you got into the project and it was partially finished and more particularly when it was finished, then you

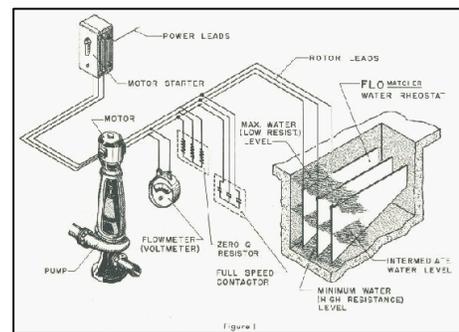
had to look ahead. You couldn't look back. And I think everyone always looked ahead, and looked ahead successfully, and looked ahead in plenty of time, so that they had something else to take its place.

What do you personally consider your greatest achievement?

Well, I'm not sure that I can point to any one greatest achievement. If the whole adds up to something significant, that doesn't particularly surprise me but there isn't any one thing that stands out in my mind as being the most significant thing. I guess the most significant thing as far as the business is concerned was making the decision to come with it—putting it together. Maybe that was the secret for its success—that it was a team, and it was the product of the team that made it successful and not any one individual. You know, the Flomatcher doesn't stand out to me as any great pinnacle of success from my standpoint. That was just another job to do. Just like any number of others. No more important and no less important.

Yet you're recognized particularly for developing it.

Yes, but, you know, to me that doesn't stand out as anything any more significant than a lot of other things that I can think of.



Early Flomatcher Schematic

I would think that you'd have some projects that you were more proud of than others? Are there some projects that are more memorable to you than others?

Well, sure. I tended to enjoy those projects in which I historically had had an interest, more of an interest. And, basically, my interest, originally, was in electric power system analysis. Now, we've never been able to do very much of that, the reason being that most utilities do their own. Bonneville does their own. Most big utilities have their own people that do it, or they farm it out to a manufacturing firm or someone, so we really haven't been able to do very much of this power system analysis.

We did one job for the British Columbia Hydro Authority which I enjoyed very much, but it was not an important project. I enjoyed it, personally, because it was the sort of thing that I enjoyed from a technical standpoint. I think, as far as personal enjoyment is concerned, I, have generally enjoyed working on the hydroelectric plants more than I have enjoyed working on some of the other types of things that we've done. But the amount of time that you really get to spend doing any of those things is rather small compared with the whole thing that you have to do—you know, the programming of people, and generating new business, holding the client's hand, and trying to keep him satisfied, and doing a whole lot of other things. These are all just as important as anything else.

Some of them aren't as much fun as other things but they are still important and they have to be done.

You mentioned a few minutes ago that the spirit of teamwork among the original partners is one of the keys to the success of the firm. Has this spirit continued to the present? Is there still teamwork, working together?

I think so. You know, it's different; it couldn't help but be different because it's so large. There are so few people that I really know now, and I think that's true of a lot of other people, though I suspect I know fewer than most. But—well just the other day... we've been working on a project for a very large Swedish electrical manufacturing firm, and last Friday they put on kind of a smorgasbord in here in the conference room for all of our people that had worked on this because the deadline was Saturday and stuff had to be turned in. And the vice-president of the company got up and said that in all of the activity that they'd had—now this spans from 1870 on up, and they've done some very, very large projects—he said that they had never worked with anyone that had as much cooperation as we have. I think he was honest when he said this; I think it's true. I don't think he just said it; I think he meant it; and I think he was surprised. I don't know why people behave that way here, but they do. By and large, people cooperate.

What is it about your firm that results in more cooperation than among people in other firms?

I don't know. You know, maybe it's just the way the place got started. Maybe, fundamentally it goes back to the concepts that the four or six people that started it put into it. Maybe that's just continued. But, for some reason, it still is a factor and people will stay here noon hours, and they'll stay here evenings, and they'll stay here weekends to get things done. And they take a pride in what they've done.

Gee, that's motivation you can't buy. You have to generate it somehow; you can't pay for it; somehow we manage to generate it. I think we're real fortunate. I don't know that we're that smart but I think we're extremely fortunate. I think a lot of the credit for that sort of thing, belongs to people like Jim because he has that fundamental concept of life. Fundamentally, it is a cooperative type of concept and I think that's probably imbued the people throughout the firm. So if you had to pick out any one person that you thought was more responsible than anyone else, I guess I'd have to say that I think Jim is probably as responsible as any single person.

What's going to happen when he finally retires?

Oh, it'll continue. It'll continue as long as the people that follow along in these footsteps and in our footsteps as long as people behave in the same way—put the organization ahead of themselves and so forth—it'll continue. When they stop doing that, then it won't continue. Then you're going to have the same kind of problems other people have.

If you could start the firm all over again, what would you do differently?

[Pause] Oh, not many things. Not many things. I believe our location is unfortunate.

Why is that?

Well, I think it was very fortunate in the early days, having it here in Corvallis; and Corvallis certainly is a nice place to live. I like to live here. But this is not the right place for this kind of an office; it's really not the right place for us to be. But now that we're here, it's very difficult to change. And I think that's the only thing that I can think of that we would have been better off had we changed. Now, the trouble with saying that is that there are a number of factors which would have been a problem of one magnitude or another if we hadn't been in Corvallis.

Fred Merryfield, for example?

Fred Merryfield for example, that's right.

Where would have been better? Portland, you mean?

Oh, yes. Yes, some city that has good transportation and communications. Eugene wouldn't be any better; Salem wouldn't be any better; Portland would be. You have to have some place where it is easy for people to get in and out.

That's been a problem here, having no airport?

Yes. It's not difficult for us, you see. You know, I have a car. If I want to go someplace, I get in the car and drive up to the airport in Portland, park the car, get in the airplane, and go. When I come back, I can always get into Portland and get into my car and come home; that's no problem. But somebody from New York, who wants to get here, has more of a problem. He has to rent a car; he has to make some other arrangements and he spends... it doesn't bother me to drive from Portland down here because I've done it so often, it's old hat; I've done it many, many times. For someone from New York, it's a new experience; and not necessarily one that he enjoys because he's tired from having flown across the country, and he's got other things that he wants to do, and driving two hours to Corvallis isn't something that's high on his priority list, you see. So that's a difficult thing.

It's difficult for our people from the other offices to get here; and an onerous thing. They'd don't enjoy it. They don't like it very well. Not all of it is realistic. I can leave here and in two hours I can be on an airplane in Portland. If I were to leave the office in Seattle to catch an airplane at Seattle International Airport, I'd leave at least an hour before plane time. So there is a difference.

Here we are, clear outside the city—a long ways outside the city—it only takes us an hour more to get to the airport than it would if we were right inside the city like we are in Seattle. But it is different; people feel

differently; I can't tell you exactly why but they do. So that makes for a problem. And I really think that's the principal problem that we have.

As far as people are concerned, I can't believe that we could be any more fortunate than to have most of the people that we have now. There are a few people that I've seen floating around that I'd like to have. A lot of the people that have been floating around that we wanted to have; we just went out and got them. We don't have all the good people, but we have more than our share.

Now that you've expanded and have offices in Portland and Seattle and other major cities, is this transportation situation still a problem?

Oh, it's worse. Because people do more traveling. You know, when we were working in Eugene and Salem and Forest Grove and so forth, travel with a car was the easy thing to do and the way we did it. Now, when people are going to Denver and Albuquerque and Stockholm and Trinidad and so forth, then it is more of a problem; and it appears more of a problem to people.

There is another factor, too. I think, in Corvallis and in any smaller community that is away from the center of things, you have to be very careful that you don't get stale.

Don't your contacts with OSU help you keep up with the current technology?

It will help you keep up with some things, with some forms of technology and so forth. But even the university is not up-to-date on a lot of things. They may be up-to-date on some of the very highest forms of technology but as far as being able to discuss the solid state excitation of an alternating current generator, they know what you're talking about but they probably don't know that much about it—the details.

They don't know where you get the equipment; they don't know what it would cost; they don't know what the failure rates are. These are things that you find out by sitting down and talking with people, other people, who have had these experiences and you, do this when you are in an area where there are a lot of these people having these experiences.

There aren't that many in Corvallis that have them so you don't talk about them very much, except in our own shop. But, as far as running in to someone downtown and talking about them, we don't.

In Portland, this would be a much more common problem, and you've got several manufacturer's representatives you can go to and ask their opinions and so forth; but the University has no opinion on a thing like that. If you wanted to find out about the thyristor or the diodes, and all of the other devices that you had put into such a piece of equipment, they can tell you all about the specific pieces of equipment; but they can't tell you the story about the whole, and how it is operated, and who manufactures them, and what their availability is, and what their cost is,

and things of this nature. So there is a factor there that means that you would be better off in a larger city.

You mentioned in the Hilton interview, that one moment of pride was when the firm was featured on the cover of Consulting Engineer.

Oh, sure. Yes, I think that was a highlight. I had forgotten about that. But that was a magazine that got a lot of circulation amongst your peers. I don't think that did any good in so far as the Pacific Power and Light Company or the city of Oswego, because they never saw that magazine; that magazine just went to other engineering firms. But it just put you a peg or two ahead of your competition; that makes you feel good.

What a nice picture!

It was taken over here at Ball Studio.

Are there other moments of pride like that, which you can recall?

Well, they pass pretty fast, I imagine, because I don't remember them now; but I'm sure there were. I'm sure there were. When we moved into this building, that was a moment of pride. It really was. It wasn't much of a building, but it was ours and it was a mark of distinction. You know, we had our own building. We were having trouble keeping it warm and people were uncomfortable and there were a lot of things wrong with it and yet, you know, it was something that you had pride in. There are a whole host of things of this kind that come up but they pass quickly. And they really aren't that important, usually.

Could you comment on how the preparation of engineers in your day differs from the preparation today?

Well, of course, we know a lot more now than we knew when I was in school. We have a lot more things to work with, most particularly the computer. It used to be that there were a lot of things that we knew could be done, except there just wasn't time enough to go through the laborious calculations to get it done. There were easier ways of doing it or sometimes you just didn't do it at all. Today, with the computer, you can simulate almost anything. Basically that's all you do.

An engineering problem is really a problem of modeling the problem so that selecting the solution is a lot less expensive than the solution itself; and you do that by modeling. Now, there are a lot of ways of modeling. You know, you can actually build a small physical model of whatever you're working with and tinker with it; test it this way and test it that way. Or you can simulate it by making a mathematical model, in which you have to describe everything that goes on, with a bunch of equations that represent it. Invariably, when you do that, you end up with a whole lot of equations that have to be solved simultaneously, and you can't do it by hand. It's just a fantastic problem.

I remember when I was in graduate school that we were introduced to a form of mathematics called matrix algebra. The subject was in 'power system analysis; that was basically where my interest was at that time. The people that were teaching the subject told us the matrix algebra was used largely because it would give us the form of the answer. It wouldn't give us the number, it wouldn't give us a final answer, just give us the form. And later on, after I was out in practice and working for a firm back in Boston, I set up a matrix of electric power system that we were analyzing and tried to handle that matrix. It was not a large one as matrices go, and after a month of intensive work on it, I was so far from the solution, that I gave up on it.

I understood then exactly what they were saying. It is just physically impossible to solve that many equations simultaneously by hand. It is still a problem now but the computer, the programmable computer, can handle that. A programmable computer is just like hundreds and hundreds of fourth grade students in arithmetic that are all sitting down there waiting to do whatever you tell them to do. That's all it is. All it can do is multiply and add and subtract and divide. Somebody at the top says, "You do something and give your answer to him and he'll do something else to it and give the answer to that one;" each one does one little simple operation and hands the result to somebody else who does something else with it that isn't very complicated. And by having the tremendous body of effort that's all programmed, you can do tremendous things. That's all a computer is.

So, obviously, the computer is used extensively in engineering?

Yeah. You know, it's the thing, really, that makes the difference between the way in which we approach problems today and the way we approached them thirty or forty years ago.

And engineering students today are getting a firm background in computer science?

Oh, I think they all get a firm background in computer science, yes. I'm sure that's right. And I think it's very important; I don't think it's mandatory. I don't know anything about computers, really. You know, I've tinkered with them and I've designed little pieces and parts of them in the past and so forth, but as far as sitting down and operating our computer, I don't know even how to address it. There are a bunch of rules that you have to have and so forth to sit down at the keyboard and address the computer and get it to accept your problem. I don't know the techniques for doing that. It's just like, how do you run a typewriter; if you're not a typist, you can't run one. So that's something you have to learn; it's a mechanical thing, largely. But we have a lot of people around here who can [operate a computer]; and, if you can express to them what it is that you want done, they'll see that it happens. So you don't really have to be

an expert with a computer as long as you have got a lot of programmers around.

Who recognized the need for a computer for your firm here?

I think a lot of people recognized the need for it. Holly Cornell was the one that did something about it. The rest of us said, "Gee, it would be nice if we had it this way." And several things that we had need for, solutions that we had need for, we farmed out to various people.

Years and years ago the university over here bought their first computer called an ALWAC; I don't remember anymore what that stands for. It wasn't a very big computer. You could put it in this room. And it wasn't a very powerful one either. But for its day, it did pretty well. And when they were trying to get the computer, we gave them some money to help them buy it and so forth. And for that, periodically on demand, they would run stuff through their computer for us, sometimes successfully, very often without. It was a very frustrating experience working on the early computers because, you know, if your logic system wasn't absolutely perfect, you got bad answers, and trying to find out where the imperfect piece of logic was, was very difficult.

You put all your data and all the instructions and so forth on punched IBM cards—a card about so by so [2½" × 3" × 7" long] with a bunch of holes poked in it. The upper left hand corner is clipped off of them. I never really knew why it was clipped off except that was maybe the way to keep them straight so you didn't get them upside down or backwards or something. If one of those holes was in the wrong place, why it didn't run; it got the wrong answer.

Now to find that was really quite a problem. So in the early days it was very frustrating to try to get anything done. The machines didn't have the kind of capability that we really needed, and the access to the machines was difficult because of the way that you put numbers into them. Of course, the number system is different.

The machine doesn't count by tens, it counts by twos. The only numbers that a calculator has are zero and one; that's its number system. You can use any kind of a number system, you know. We [Americans] use the Arabic system which, I suspect, has ten digits because you've gotten fingers, and that is one way to count them: one, two, three, four, five and so on. That is probably the poorest numbering system you could have. It's very unfortunate that we ever adopted it; the binary system where you have zero and one is far superior.

All of the systems are better than ten. Ten is hard to work with; if you work with fractions, the only number that ten is divisible by is one, two and five. You take the number twelve, and it's divisible by one, two, three, four, and six. So it is much easier to work with fractions if you have a base of twelve; that's called a duodecimal system; computers just can't work with those. They work with some variation of the number zero and

one, and then they convert. But they can convert. They do all their work in the binary system and then they'll convert it to a decimal system for you.

Now the machines are big enough, fast enough, they have a memory big enough, so they can put together what they call compilers so that you can communicate easily. You don't have to put in the binary number. Put in a decimal number, the machine will convert it. And if you want to multiply "A" times "B" in Fortran, which is one of the compilers, why you write, "A*B" or "10*5" and it'll multiply that, and you sit down at a keyboard, and you've got a oscilloscope in front of you and it types all of this stuff out and you can see what it looks like. A whole new ball game. I worked on a computer back East for a little while, you know, and this was before the war. They had a half a million dollars invested in it.

It was a differential analyzer. It would solve thirty-three simultaneous differential equations of the thirty-third order but it couldn't add one and one and get two. And we never could make it add one and one and get two.

It just wasn't capable?

Well, you'd tell it to add one and one and it would come out one and nine-tenths or something like that. It would be approximately two but it never came out two point zero. And, you see, gee, those things are not, you know, crap... I have a little pocket calculator here that's good for up to ten places. I ask it what's pi to ten places and [makes noise] you know.

You can get them on your watch.

You can get them on your watch, that's right.

Were there people in the firm that didn't recognize the need for computers?

Oh, I think everybody recognized the need but to start making major use of one is such a difficult decision. The expense is tremendous. And if you aren't very careful, it's a long time before you can start seeing real benefits from using the computer, benefits that you can put your finger on.

How did Holly Cornell...

Holly was the one who... You know, I used to play on the fringes of this and use them and so forth, but I'd use somebody else's [expertise]. If I had a problem, I'd get somebody else to program it, run it on the university's computer, or take it back to Boston, or take it to someplace and run it. I simply didn't have the courage, or the foresight as to how we could spend several hundred thousand dollars of the firm's money to develop a computer center.

What did the other founders or partners think?

Well, I have a feeling maybe Jim shared my problem, my feeling. Holly, I think, was the one who decided that this was something that we've got to get into; this is an investment we need to make. He sat down and essentially he looked into it with some of the people that he was working with and talked everyone into making the investment. He's the one that's responsible for the computer center. Indirectly perhaps, but responsible. I'm not and I don't think anybody else is. I think you would have to say Holly is the only one who is responsible, the only principal who was truly responsible.

I know that Clair Hill had some bad luck with his computer.

Yeah. He made some major investments in computers fairly early on; you know, like twelve, thirteen, fourteen years ago. And he was trying to develop things for the computer to do for people outside-- sell the services of the computer—and I'm not sure that he was ever able to make that fly. This was in the period when a lot of people really couldn't see all the advantages that you could get out of a computer and the computers themselves were ungainly and difficult to address and difficult to use. The compiler languages weren't available then. Generally, you had to write things in machine language.

Considering all these problems, do you think Holly saw a use for them?

Well, I think that one of the reasons was that the structural engineers—Holly was a structural engineer basically—and the structural engineers probably had as much use for a computer early on as anyone. The structurals and the electricals were the ones that had the early use for the computer, I think, more than anybody else. And because he was a structural, he recognized that the programs were necessary and I think that's basically how he got started.

We had a small computer initially. I think it was, an IBM 1130, 1620 maybe. I have forgotten. You know, they keep changing the numbers all the time; 1620 may have been the first one. I don't really remember, you know, where all those came from and I'm probably getting some of my things confused; but I have the very strong conviction that the guy that's responsible for the computer setup is Holly. But I'd have trouble documenting it, I think, because I really wasn't that familiar with what was going on.

So you consider that one of his major contributions?

Oh, Yeah. I think so. He wrote a paper on the subject when he was the manager in Seattle. Holly went up to Seattle and opened the Seattle office for us and was the manager up there for about ten years. And while he was up there, he did a number of things which were real valuable to us. One of them was the putting together of the Policies and Procedures Manual which formalized a whole bunch of things that we had paid lip service to. People sort of remembered them but they weren't written

down; there wasn't any way that you tell people that this is the way we do things until that Policies and Procedures Manual was done.

Well, he did the same thing with the computer. He put together a paper that indicated that we ought to get into the computer business and then with the help of some other people—notably one of them was Bill Toole, he used to play basketball up here—we got a small computer. I think the first one that we had was an IBM 1620, and then we traded it off and got something else and ultimately ended up with the systems that we have here; we have several of them now. But basically, if you were going to pick out anyone and say, "Who is responsible for us having a computer?" why Holly was more responsible than anybody else. Now, I don't think he knew anything about a computer as far as programming and using one. I've never seen him use one and he doesn't have to. As long as we have access to one, and we have people who can run it, that's all that's necessary.

He was perhaps more farsighted than the rest of you...?

Well, he was willing to spend more time and direct the time; you know, put his shoulder to the wheel. I think I recognized that there were some real advantages to having a computer but I had never assessed whether or not it was reasonable.

I've noticed in talking to you six men that you show what would seem to be an unusual amount of humility, humbleness, unpretentiousness for men in your position. Can you comment on that?

I don't know. I really don't know. People say, you know, "Aren't you ever proud of the office, the size of the offices?" The answer is, "Yeah, if I sit down and think about it; yes, I'm proud and I'm pleased." But I never spend much time thinking about it because I guess I just don't think it's that important. And I think Holly and Jim and Fred and Archie and so forth, you know, [are] the same way. The Neptune Meter Company wanted Archie Rice to become their executive vice-president in New York and do you know what he said? "I'll take the job if you move it to Corvallis." Now this is a big Board company. This is a company that's on the New York Stock Exchange, has been for years.

Good heavens, that's quite incredible.

And you know, of course, they weren't going to move their corporate headquarters. They did move them out of New York ultimately to Atlanta but they weren't about to move them out here, you know. Of course this was ridiculous to even think about but that's the way Archie was put together. "Sure, I'll take the job if you move it to Corvallis."

Why is that? Do you think this attitude had common historical roots? For instance, you partners came out of the Depression? Or, was it because of your upbringing?

You know, that may be. But I think if you went around the office and talked to a whole host of our people you might be surprised at the number of them that are not impressed by the fact that a magazine says that CH2M HILL is the tenth largest or the fifth largest or whatever largest it is.

I don't even pay any attention to that; it doesn't impress me; it doesn't excite me. I am proud of the fact that they made a profit last year, you know, in an adverse year.

Those things I'm pleased with, but the size, the publicity, things of this nature, they don't buy me much. And I think if you went around and talked to a whole bunch of our people just at random, that you'd find that there are a lot of them that don't think that's going to buy them much either. They are pretty much down to earth bunch of people. And if they weren't, I have a feeling that they wouldn't get past the Personnel Section.

That's the general philosophy of the firm?

Pretty much. I think that's probably true. There are bound to be exceptions.

Maybe because the firm has its roots in Corvallis. Corvallis isn't a prestigious place for the headquarters of a large firm. If your head-quarters had been located in New York or San Francisco, you might have attracted a different type of person?

Could be, I don't know. Can't answer your question very well. I really have never thought very much about it. It never bothered me. You know, it's never been very important. It's like this office, you know. When they asked me if I'd move up here, they were apologetic.

Because it's much smaller, you mean?

But, you know, it's big enough for me. I don't have any need for any space; it has good lights, warm. As a matter of fact, it's a darn sight warmer than that other one that I was in. It was cold down there, and that I didn't like. You know, one of the fellows said, David Gee, it's real cold in here, and he got me an electric heater and plugged it in and then it was in there all the rest of the time I was there. I didn't always use it because that is kind of an expensive operation. That [office space] doesn't buy me anything; I don't think Jim cares where he is. I don't think Holly cares.

Does Harlan Moyer feel the same way?

I don't know Harlan that well, to be real honest. I don't know Harlan. I don't really know Earl that well. Holly and Jim, you know, we've always been pretty close together. But I don't know the others that well. I do know that office space is a problem. Some of the office space is more desirable than others. If you've got a corner office with windows on two sides and somebody puts drapes up and so forth, why, you know, that's a

kind of a [destructive] mark that most people really aspire to. I used to have an office downstairs that didn't have a window in it and I liked that. I liked it because it was remote, really. I didn't give a damn about the window because I never look out the window. I've got my things [shades] pulled anyway. And I'd pull them if it looked out on Central Park.

Why?

Well, you know, the outside light doesn't buy me anything and it's distracting. So just as soon as I move in here or any office, if it was a corner office, down come the blinds.

It doesn't rest your eyes to look out on greenery?

Well, if it does, why I turn around and raise the blinds, maybe. But, sure, sometimes I think that has merit; but office space is not important to me and it's not important to Jim. I notice it does bother the kids. It bothers our kids. When Torn comes over, he says, "Oh, golly. What are you doing in that small office?" "Well, there is nothing wrong with this small..." "Well, you ought to have a bigger office." "Well, no, I shouldn't have a bigger office. It's not that important. This is a good office. It's great. I've got everything I need." I think Fred would feel the same way. I'm not sure that Fred ever had an office to himself until he came over here to the [CH2M] office. I think every office he ever had over to the university he shared with someone. And I don't think it bothered him a bit. Just wasn't important.

THE ROLE OF ENGINEERS, WOMEN, SPECIALIZATION, AND THE UNIVERSITY

How has the increasing specialization in various areas of engineering affected the operation of the firm?

Well, it makes it more diverse. It makes it more difficult to manage, but it offers greater opportunities for more people. It's got problems and advantages both.

But can a consulting engineering firm possibly cover all the areas of specialization that are...

No. It depends on what your corporate objective is. If your corporate objective covers that possibility, why, yes, you can. But I think it's a terrible mistake to violate your corporate objective. For example, I was speaking a little bit ago about some equipment that some of our people had developed. They want to manufacture it and sell it. I think that's a mistake. After studying it, my recommendations were that it's a very valuable piece of equipment as far as we're concerned; it's a very valuable piece of equipment as far as any other engineering firm or architect is concerned; but we shouldn't manufacture and sell it.

Now is that because of your experience with the Flomatcher and Microfloc?

Partly, partly. But more to the point, that's not our business.

Oh, I see.

It's not our business and we're getting into something that we really don't know very much about, and I think that's a mistake. Now, we can take that and turn it over to somebody else who's interested in it and say, "You manufacture it and you market it and just give us a royalty." But for us to get into that without adequate preparation which is expensive, and putting it aside, and setting it up with its own management and everything, those are, I think, a mistake for us.

It's not our business. It's just like going into the cosmetic business. You might be able to make a fortune in the cosmetic business but that's not our business. We'd be better off to invest what money we have doing the things we know how to do. So if moving into a new engineering area is something that is a part of our corporate objective, and it fits with the things that we do and do well and know how to do, and has risks that we're willing to undertake, fine. If it doesn't comply with that, then you'd better not do it.

Are there some areas that CH2M has not competed in in the engineering field?

Yes.

What are they?

Nuclear.

Why?

We were too late getting into it and it's too expensive to get into it.

Was that area analyzed for possibilities by the firm?

We talked about it early on and made that decision: it's something that's going to cost too much money and we won't even try. Steam power plants is another area where we have never attempted to compete; and if we were to compete, the only way to [do so], I believe, would be to acquire a firm which has a record of doing steam power plants.

That's a possibility then?

Well, it's a possibility but I guess I'm not sure that I think that the opportunities in that area are so enticing that we would want to do it. I think there are other things that we could probably do better and do better with.

Do you think you should have gotten in nuclear energy at all?

No.

It was a good decision back then?

Well, I think it was a fortuitous one. Not that I have anything against nuclear energy, because I don't. I think that it is a perfectly safe, satisfactory way of generating electric power. But for us not to get into it was a very wise decision, and for the last ten years those who have gotten into it have really been hurting.

Yes. When was that decision made?

Oh, in the fifties. Long time ago. Of course the nuclear bit, you know, is not new. I can't remember when the first plant in Pittsburgh started operating but it must have been in the mid-fifties, sixties, something in there. The Commonwealth Edison plants at Dresden, I think, were all finished and operating by 1960 or before 1965. There's nothing new really about that.

Well, nuclear energy is controversial today.

Yeah, it sure is.

Was economics always the primary guidepost for the firm? Is that the motivation?

Well, it's one. It certainly is one. It's not the only one. I think that we—Jim has spelled it out really, but I think that everybody has always saluted it that you have to enjoy your work. If the people don't enjoy their work, then there is something wrong. Now, that's not an economic consideration. But you [do] have to make a profit or you can't keep going. You know, that's just fundamental. If you don't pay attention to the costs and the income, you can't make it successful.

What about the responsibility for the public interests? For example, in land use planning and dealing with natural resources. For instance, when building a dam, is the possible effect on anadromous fish ever a consideration?

Yes. I think that's a consideration and, I guess, we are probably middle-of-the-roaders in that. For example, Fred was instrumental in cleaning up the Willamette River. Governor McCall gets the credit for it but Fred's the one who cleaned up the Willamette River. And he started a long time ago; he started in the mid-1930s.

When Holly and Jim were students of his, why, he had them down there working on the river. And, yet, when some of the industries got into trouble with the state over compliance and so forth, Fred was the one that would come forward with a scheme that would help them get over the hump. For example, he'd say to them, "Now, let's find a place where we can store your wastes over here. We'll keep them over there and treat them as best we can without spending a lot of money and then when we have that big flood, we'll let them go, because it won't make a bit of difference in there. There is so little waste and so much water going down stream and all of it is muddy and everything, it isn't going to hurt a thing."

And so they bought that. Boise Cascade had ponds in Salem, and Crown Zellerbach had ponds down there in Oregon City. Those were Fred's ideas. He had as his mission cleaning up the river but he was very reasonable about it. He played both sides, you know. He recognized that you've got to clean up the river but you can't tear up the whole economic community to do it. That's something that's missing in many people's approach. Some people say, "To hell with the, environment," and the others say, "To hell with everything but the environment." And both of them are wrong.

When engineering feasibility and the public interest don't coincide, as sometimes happens, what is the solution for CH2M HILL?

We have tried, I think, honestly and always, to be reasonable. I think we have tried to be reasonable in the same way that Fred was trying to be reasonable about it. I don't think that any of our people lean over backwards. Everybody in the organization, I think, recognizes the need for planning. I think you can only go so far in your planning before it becomes a tremendous burden or even more than a burden. We've been involved in projects where we didn't really think that there is a significant environmental problem, but where others thought there was an environmental problem, and maybe the opportunities to build a project disappeared because of the environmental problems. We haven't always been right, but I think we've always tried to be reasonable. I don't think we've ever tried to put something together to the unreal detriment of the area. For example, the McKenzie River down here. We did a lot of work for the Eugene Water and Electric Board in trying to develop power plant sites on the McKenzie River and the environmentalists were always all over us

because of that. Have you been up the McKenzie River twenty-five or thirty years ago and then gone up it now?

No.

Well, the people that have enjoyed the McKenzie River have ruined it. Everybody living up there, you know. Gee, it's just one house after another. It didn't use to be like that. It was a gorgeous place. But you see those are the people that said, "Gee, you can't do this and you can't do that." They would have been better off to have some of those power plants up there with the lakes and the other things than to have all the other things that have been developed right along, the trailers parked here and there, you know. Gee, it's just a disaster up there. I'm sure that those people don't feel that way. I'm sure they'd feel that I was wrong.

One of the things that used to bother me a lot was I would go up the river, and I'd count the number of people who were enjoying the river in one place or another, and the number of people who were enjoying the river and the ponds and the lakes and so forth, you know with families and kids playing in the water and people fishing and so forth, and there was a hundred [of the latter] to one [of the former].

You're probably not counting the ones that just like to look and maybe drive by or walk by the river?

That could be. But the ones who were out enjoying the water, you know, the number of people who were out enjoying the white water, fishing, and so forth were just a hundred to one to those that were enjoying the lakes. Now, obviously, you can't just have one huge lake up there. That isn't going to work. But, I think what the water Board has done up on the McKenzie is reasonable. I think that's the key to it. You have to be reasonable.

To what extent and in what way should a practicing engineer assume responsibility for public interests, or is that something that should be considered?

Well, I think the only way that you can consider it is to put yourself in the other fellow's place and say, "How would I function if I were in this individual's place and that individual's place?" This is something that we learned from McGown and his human engineering [course]. That's the way you make decisions. If you want to find out how to make a decision that involves somebody else, why, you just pick yourself up and put yourself down in his place and say, "Now, how would I feel?"

Do most engineers get that kind of training?

No, don't think so. I think some of them just naturally have it, and some of them develop it, and many of them, maybe most of them, never heard of it.

Do you think CH2M HILL has a responsibility to teach or point out to your engineers the need for some consideration of public interest?

Yeah, I'm sure they have some responsibility. The engineers are better off if they learn it, so you try to teach them informally by your contacts and your conversations with them, you know, and so forth. I think it's real difficult and rather pointless to do it on a formal basis.

Do you think there is a recognition of that problem in this firm at all?

In some people; in some people not. I really don't have much of an opinion how that would divide. I think the number of engineers who really are involved with the public, and interested in the public, is probably a lot less than the number of lawyers who would be interested in the public's reaction. That's a difference, I think, in the things that you [engineers versus lawyers] do and the way that you do them.

And this idea of responsibility for the public interest was never conceptualized by your president?

Well, I don't think it's ever been stated. I doubt that you can find very many people in the firm who don't, just innately, have a feeling that they are not going to do anything which is clearly not in the public interest. I think most of our people have a very, very high degree of pride in their professional ethics. I think many times they lean over backwards. And I think that's true probably of most engineers. You know, they are not—they are kind of a funny group. But I think that is very, very true of our office. I think you would have trouble finding somebody who would just say, "To hell with the public. I'm going to go out and build this transmission line right through here because it's a straight line."

You had a different answer when the question was asked before.

What did I answer?

Jim Howland. That's the answer you gave.

Is that right?

Yes.

Well, I think the same thing is true, it's just said in a different way.

I'm going to ask a question that was asked of you a couple of years ago, not by me: if there is one thing above all others that you regard as having made your organization different than your competition, what would you say it was?

Well, I think one of them was that we tried very hard to offer a balanced and complete service. In other words, if we were putting a project together, we wanted to be able to do all of the work—do the work of the handrails on the lighting as well as you do the structural part. I think that is one area where we were doing a better job than some of our early competition. Now, I think, everybody realizes that; but I don't think they

all realized it when we opened the door. I guess that's one. I think the second thing is that we have always felt that people had to enjoy their work if they were going to be successful, and the work was going to be done well. They had to enjoy their work as well as being reasonably paid for it, and if they couldn't enjoy their work, then you'd better not be in it.

How did you feel about women professionals coming into the firm? Was there any reluctance employing women?

Not on my part. I don't think there was any reluctance on the part of most of our people. There were a few. I can remember a few comments about "Isn't it too bad that we can't hire men stenographers" and so forth, but those people that would make comments like that, were in the vast minority—one percent. No. Having women engineers around, I think that's great. I'm all for it.

It's only been in the last decade or so though, hasn't it?

Well, there haven't been very many women engineers and most of the women engineers have been electricals; you know, way back. I think there is a reason for that. The electrical area is more an analysis area and less dirty-hands area than most of the other areas. It is more pencil pushing and less nuts and bolts than the mechanicals and the civils have to do.

Why should that matter?

Well, twenty years ago or thirty years ago, it was easier for a woman to work in a laboratory, or work as an analyst, than it was to work as a mechanic. It just was. You have to work as a mechanic before you can do a lot of other things just to get started; but to work as an analyst, you start in working on a piece of laboratory equipment, and it was fairly easy for a woman to do.

The General Electric Company had a very famous woman engineer, Edith Clark, who was quite elderly when I was in school. The city of Los Angeles had a woman, Mabel McFerren Rockwell, who was a very well-known engineer—electrical engineer—that helped build some of the transmission lines or designs them between the Hoover Dam and Los Angeles way back in the thirties. But, you know, they were few and far between. I think that if they had been available, people would have hired them. But women weren't interested in that. These two were characters.

This one, Mabel McFerren Rockwell, in Los Angeles, I got to work with her a little bit at Bonneville one summer. She had been hired by the Secretary of the Interior to go up to—she was a private consultant by this time, she was no longer working for the city of Los Angeles—the Secretary of Interior hired her to go up to Bonneville and look at things and report to him now things were being done. Bonneville was just being formed and just getting started.

This was in 1940, 1939 I guess. She got off on the wrong foot right off the bat. She didn't say who she was, she came to the office and wanted to see Mr. Carey who was the chief engineer, and he didn't know that anybody was coming to do this, and so they let her sit there for about fifteen or twenty minutes because he was busy; when he saw her, I guess he wasn't as nice to her as he might have been and before she got through, she kind of took him apart.

I was working with the System Engineering Section and that was where her interest was, in analysis, basically. She spent quite a bit of time in the System Engineering Section going over some of the things that we were doing and she was an extremely competent, extremely competent, person. I had no feelings then about the fact that she was a woman.

So it wouldn't have bothered you to hire a woman engineer if there were some to hire back in the infancy of the firm?

No, sir. You know, if they can provide the services that you need and are willing to work under the circumstances that you have to work under, that is all you can expect. I don't care whether they are red, white, or blue.

Do you remember the first woman professional that the firm hired?

No, I don't. And I think it probably hasn't been too long. We had a lot of girls that were working here as secretaries and so forth; some of whom were extremely valuable employees, did some extremely valuable things. One girl that early on, started the Word Processing Center and got us started using the electronic typewriters and so forth. Her name was Della Hickey at that time. Now, Della started out as a telephone operator, eighteen years old. We had someone running the front office at that stage of the game and she left, and Della went into Jim's office and said, "Jim, I can handle that job as well as anybody you can find," and Jim finally let her try it.

And she did a great job. Extremely valuable person. Now, she didn't make very many friends. You go around the office and talk to them and a lot of the people used to say real bad things about her, but I think that has probably cooled a lot now.

She didn't make very many friends but she got things done. She was an extremely valuable person. I had no objection to her; as a matter of fact, she later worked as my assistant when I was doing business development, and I thought she did everything that you could expect. If you weren't there and something happened, she would go ahead and make a decision and when you got back, she would say, "You weren't here and something had to be done, so I did it."



Della Hickey Matthews

You didn't witness much discrimination against women?

No. There were a few people, few people who would say, "Gee, isn't it too bad;" but I think they were in the vast minority. I can't remember who the first woman professional that we had, professional was being an engineer. But if one had shown up in 1950, and was interested and could do the things, and we had a need for the things that she could do, I don't think there would have been any problem with taking her on at all.

You mentioned that the primary reason for establishing the firm here in Corvallis was because Oregon State University and the faculty's expertise, and its library facilities and so forth, were here. Is there currently a reciprocal relationship between the university and CH2M HILL?

Not so much. Not so much. We very seldom used their laboratories. If we have a problem that requires laboratory use, you know, I don't know where it might go. It might go here, it might go, someplace else. There are so many laboratories you have available to you, that you tend to go where you have experience and where you have connections and so forth, and we do have connections with many other schools today. The big problem that most people don't recognize with the university is they have the very highly technical expertise but they don't always have the ability to apply that to today's problems.

That's a shortcoming of the university.

That's a shortcoming of many universities. Not this one. But it's a shortcoming of many. Not all of them have those shortcomings. Some of them have more than others. A lot depends upon how much relationship the people in the university have with the outside. I think one of the problems we have, in being in a community the size of Corvallis, is that your connections with the outside are not as strong as they would be if you were in San Francisco or Los Angeles. Your connections with the business world, the outside professional world are much stronger there than they would be here. And that, to some degree, I think, is a problem for the university.

For this university because...

Well, this university, Washington State, Idaho, you know. All the universities that are sort of isolated. Now, other offices say that about the Corvallis office of CH2M: "You're isolated; you're not always up to date; you don't really know what's going on. And to some degree, they're right.

Even though you have other offices in Seattle; Portland; Gainesville, Florida; and California? You're not up to date?

Well, it's not easy to maintain connection with the people who are in the forefront of developing new ideas and things of this nature. I think the people in the smaller offices, and in Redding and in Boise and in Corvallis, I think they will probably tend to be a little more provincial in their thinking, and in their approach to things, than the ones in Portland. That doesn't necessarily mean that the Portland people are always right. I think

they are very often wrong. But they do know all of the latest things, you see, and I don't think the people in Corvallis always do. It's a struggle for the Corvallis people to stay up to date; even with the university over here it's a struggle.

Does the location of CH2M in Corvallis benefit the university then?

Well, the library, as I think I said before, the library is a benefit that you just cannot overestimate. The other values of the university are not nearly so great. We thought they would be at one time but they're really not. The part-time help, you know, that really doesn't materialize except if you're looking maybe for people that you want to hire two or three years down the road. The laboratories really are not that important, and probably not that great from a commercial standpoint. There are better laboratories from a commercial standpoint in Portland, or Seattle, or San Francisco, or someplace else; and with transportation such as it is, it's easy to get the material back and forth.

Thirty years ago it wasn't so easy or so quick; things have changed a lot. I guess I don't really think that our connection with the university is as important today as it has been in the past. At one time I tried to sell this building to the university. Our operations were divided into several divisions and one of them was CH2M Properties, and I used to be president of CH2M Properties. And at one time, I thought, "Gee, you know, we're having trouble expanding the building and getting more land to build on to the building and so forth," and I thought, "Golly, we need to get out of this and get into some other area in the Corvallis area where we have more land and more opportunities to expand without the restrictions and so forth." And the only one that I could think of that could use this building was the university. I was thinking in terms of their physical plant making use of it.

So I spent quite a bit of time in and out of Milosh Popovich's office—he used to be essentially the number two man at the university—and trying to negotiate a sale. Poppy was an engineer, a mechanical engineer, so we had a better rapport than I had with some people. And he used to say, "Gee, I don't know where we'd raise the money to build that building and besides, we don't want you to move. We feel that there are real advantages to the university to having you not too far away." So I think that the university probably recognized some strengths that they got out of the relationship, too, and I can't tell you what they all are.

I know that there were rumors a few years ago, the GT had articles, that possibly you were moving CH2M from Corvallis; and, of course, you aren't. What are the reasons why you're not, and did you really consider moving?

Yes, we've considered moving the Corporate Headquarters from Corvallis. You know, I guess, I have argued for a long time, Holly's argued for a long time, and that this is the wrong place for the Corporate Headquarters. It's too hard to get to and the communications are not very

good. You know, the president of the company is always travelling and if he has to go someplace, he has a two-hour drive at the minimum to get to the Portland airport, or an hour's drive to get to the Eugene airport. And that's an inconvenience. And it's more of an inconvenience for people that want to come to see Corporate Headquarters for one reason or another.

So we argued for a long time, both of us, which Corporate Headquarters ought to be moved. We thought they ought to go to Denver; and they have—that's where the President is located now. Now, you know, much of the administrative staff is still in Corvallis, and they aren't going to pick all those people up and do a Georgia Pacific on them, because it's too expensive. That's terribly expensive. You know, you uproot people; and you create tremendous problems when you do silly things like that. But over a period of time you can build a personnel staff in Denver as people retire from this one and transfer in and out and so forth.

So you are slowly moving to Denver.

The Corporate Headquarters are going to be moved to some other place, but it is going to be a long time before they are all moved. That [Denver] is the President's office right now and it's where it should be. Now this [Corvallis] is the biggest single office, and it may always be the biggest single office.

The fact that it isn't Corporate Headquarters doesn't change anything except where the President sits, and you can't expect him to sit in Corvallis. It's too damned hard for him to get to Milwaukee. In Denver, he can get on one airplane and he's in Milwaukee in an hour. Here, he spends a half a day or maybe a whole day getting to Milwaukee. And he has to go there fairly often, or to New York, or to Washington, or San Francisco, or someplace else. From Denver, he can go anyplace.

Are there other reasons than just the transportation problem for moving there?

Well, that's the principal one. It's the communication problem. That's the principal problem that Corporate Headquarters... Now the majority of the engineers that are developing work, they don't have that problem. I don't have that problem. I don't want to leave Corvallis. There has never been any real reason for my leaving or being anyplace else other than Corvallis. But for the people who are traveling all the time, there is a reason. Redding is a bad place; it's worse than Corvallis. It's the only place we have that's worse than Corvallis, you know. But Corvallis is off the beaten track. It really is. People love to live here. They like to come here to live. You know, you can entice someone out of Los Angeles or New York to come to Corvallis.

Out of New York?

You bet. Gee, some friends of ours up here in Bend—we have a little farm up here in Bend—he just retired as the treasurer of the Standard Oil

Company—and they have a little farm, not very big, twenty acres or something like that. His wife has a nephew who lives in Long Beach in California. The youngster came up there this last summer and spent a month or so on their farm and asked his parents if he couldn't come up here and live. And so they said, "Sure." And he's up here, and in the morning he walks three-quarters of a mile to catch the school bus so he can ride to Redmond to go to school, and he loves it. You see, it's a great place to live, and most of our people don't want to leave. And I don't blame them; I don't want to leave either.

You weren't foreseeing this problem in 1946, obviously?

Well, you couldn't foresee it, because in 1946, if we could keep our doors open and keep ourselves fed, and the lights turned on, and so forth, and if we could afford to have one or two people working for us, that's as far as we could see. And for what we were doing then, for Eugene and Cornelius and Forest Grove and Pendleton and so forth, this was a great place to be.

You didn't have airplanes until you merged with Clair Hill?

No.

Didn't airplanes make a big difference in solving the transportation problems?

Oh, it doesn't take long to drive to Forest Grove. Doesn't take long to drive to Eugene. It takes six or eight hours to drive to Pendleton; that's a long trip; that's almost on the periphery to what you could cover from here. But the others, you know a short trip. You know, to go up to McMinnville or Forest Grove is just a couple of hours and while you are going, you get your thoughts in order and so forth. It's not that bad.

But you own airplanes...

We still drive up to McMinnville.

Yes, but you fly down to Redding and Boise and possibly get some kind of larger airplane to fly even to Hawaii?

Well, they bought a new airplane here the other day—a prop jet. They can fly to Denver now. But, you know, in 1946, you couldn't see all that.

PERSONAL INTERESTS AND THE FUTURE

I understand you were a man ahead of your time concerning air pollution abatement, and recently you were involved in exploring future energy alternatives. I read some papers you wrote concerning hydrogen. You hosted a man who was very involved in hydrogen research. Can you make some comments about that?

Well, yes, I guess that's probably true. I'm ahead of my time—still ahead of it. I have always felt that we really have a temporary energy problem. I don't think it is permanent. I think we have got more energy than we have any need for.

We are having a problem right now trying to change from one form to another, and it's a difficult problem. It involves the market; it involves the way we do things; it involves the automobiles that we have, the way that we live, the houses that we live in, the way we work, where we work, when we work, and a whole host of things. But I don't think that we have a permanent energy problem. And I have certain ideas about what I think the alternatives and the answers are. I firmly believe that the big future in our energy problem is in fusion, not fission but fusion.

You don't have any atomic waste, you don't have any plutonium or anything else left over to make a bomb out of. You have some waste heat that you have got to get rid of, but it is a very clean fuel and we have tremendous amounts of it. We've got enough so that if we went ahead and wasted energy the way we used to, and continued our growth in the use of energy for the next two or three millions of years, we [would still] have that kind of energy available on earth.

But it is extremely expensive, is that the problem? Or is it the public attitude toward it?

Well, we got problems getting it, you know, figuring out how to adapt it. That's the problem. But they are making real advances. The people that were involved in it ten years ago used to tell me that if they could get the appropriations for their work doubled at that time, that they could have a prototype plant on line by 1985. Well, they didn't get the appropriations doubled. The federal government has always said, "Well, this form of energy isn't going to be available until after the turn of the century;" and since they are the ones that are putting up the money, they can sure time it.

And that is basically what's happened; that is probably when it will come due. It could have come due before that, and a lot of us thought that it should have, but, you know, when the money wasn't available for research why things had to slow down. I think we have this basic form of energy and I think that that, and solar energy of one form or another, is where most of our energy in the future is going to come from. Now, you have to have some means of storing it. You know, energy, unless you can do something with it, is fairly useless.

But it seemed to me that if we could take this energy that we have, and dissociate water into hydrogen and oxygen, and then move the hydrogen through gas pipelines—by all odds the easiest way to move energy is through a pipeline, much cheaper than moving it through a transmission line—then you could use the hydrogen for doing all the things that we do today. You could use it in your automobile as a fuel; you could use it in your home to heat it; and you could use it in a fuel cell to generate the electricity that you would need for the lights and motors that you had; and you would use thermal refrigeration like you use in a gas refrigerator. This is called the hydrogen economy, or so called. And this guy that I was conspiring with was the one that coined the term, “The Hydrogen Economy.” He was an Australian; an Englishman, basically.

He was very controversial, I was reading.

Well, but it is controversial because it is new. You know, it’s coming; I’m sure of that. You know, [with hydrogen] there is no pollution in the automobile. You drive the automobile down the road, and the only thing that you get out of it is water. It [hydrogen] has everything going for it except that it is not the way we do it, and to make that change is difficult. It takes time.

What place does CH2M HILL have in this hydrogen economy research?

Well, we don’t have any right now; and the reason, I think, it is too far off in the future. It just isn’t going to happen as quickly as I thought that it might, and so it’s too early to get involved as far as we’re concerned. I don’t really think we have any position in it other than the fact that we’ve recognized the opportunities and we’ve looked at them and have decided that there isn’t anything that we can do.

We started out, several years ago, to develop a program to see how practicable it would be to purchase electric energy from Bonneville off peak and generate hydrogen, and use that hydrogen for operating some of the buses in Portland. Well, that sounded like it had some real interesting opportunities, but at the time that we started it, we really didn’t know very much about the buses in Portland; and it turned out that all of the buses in Portland have what is known as a two-cycle General Motors diesel engine in them. They buy the buses from different companies but they all have the same engine. They do it that way because the parts are interchangeable and it’s easier for them to maintain.

Well, a two-cycle diesel is the hardest engine to convert from diesel to hydrogen that there is, so that was a tough choice right there and we didn’t find out about it until we had some work in the area. Of course, there have been changes in the cost of electric power now—really haven’t reviewed it in the last year or two—but at the time that we did this, the total [cost] included writing off the investment and buying electric power for generating the hydrogen and converting the buses to hydrogen

operation and so forth—diesel fuel would have to cost eighty cents a gallon before it would be economical, and, at that time, diesel fuel was about forty or fifty cents a gallon.

Now, diesel fuel is a dollar a gallon but electric power has gone up some. So, it's pretty hard. At that time, it didn't appear, to me at least, as though there was any possibility of putting that one together. You know, the difficulties in converting those buses is fantastic. If they had different kinds of buses, it would be different. But those buses cost \$70,000 apiece; now they probably cost more than that now. But the buses they had at that time cost \$70,000 apiece and the cost of converting the first bus to hydrogen was \$100,000, and the cost of converting each bus subsequent to that was \$20,000 to \$25,000. Well that's a whale of a lot of money that you've got to write off on top of [the cost of] your bus. That's one of the reasons why we couldn't make it work.

But, it's being done in some places and there are some people that are tinkering with it. The principal people that are tinkering with it are people who are building machinery of one kind or another, not people who are engineering firms. The Mercedes-Benz people are experimenting with a hydrogen option. Some other people in the U.S. are doing it but, you know, you just aren't going to make that conversion because it is too easy for people to buy gasoline. And that's all right. Let's use up the gasoline and then when we get through with it, why we'll go to something else. That's fine.

At a great cost, yes. Not only in money, but possibly in other ways.

Yes. That's right. I have some real concerns about burning coal for our future energy requirements for the next twenty years. Nobody really knows what's going to happen as a result of this, but when you burn that much coal, you generate a lot of carbon dioxide; and at the same time, we've cleared a lot of land here and in the jungles of South America, that used to be all green. They've cut those [natural jungles] all down in a lot of places and they are converting them into other areas, so that a lot of the green plants of the earth have been taken away, and that's what converts the carbon dioxide back to oxygen, you see. So when you increase the amount of carbon dioxide in the atmosphere and at the same time you reduce the ability to convert it back into oxygen by photosynthesis, you create some potential problems which end up with you having more carbon dioxide in the air.

We'll kill ourselves.

And there is a possibility that if you increase the carbon dioxide content in the area that you will raise the earth's temperature. And if you do that, then you start melting the ice caps; and if you do that, why the elevation of the water and the earth will raise a hundred feet or something like that which floods out New York and Portland and Seattle, or significant parts of

Portland and Seattle and San Francisco, and creates a whole host of problems.

No one really knows whether that will happen. There is probably as much reason for it not happening as there is for it happening, but those planets that have a carbon dioxide atmosphere are damned hot, like Venus. And I think that there are more valuable things that we could use the carbon in that coal for. Carbon is a building block and if we could hold on to that carbon and use it as a material and get our energy from some other source, I feel that that would be preferable; but that's not what we are going to do.

What is the place of the engineer in society? Should he be a politician and be a leader and make these decisions?

Well, I don't know. In the eyes of many people it's difficult for a person to be a good engineer and be a politician. In the eyes of many people that's an impossibility because you have to bend... You see, you can describe a lot of the things that a scientist does, or an individual who applies science like an engineer, with a set of numbers. They are exact or nearly exact. The only things that aren't that way are those things where you come in to contact with other human beings. Now [there] you can no longer describe what happens with a set of numbers and that's where judgment starts entering into these things.

In order to be a politician you have to give here and take there in order to accomplish the goals that you have set for yourself; and someone who portrays himself as being able to describe everything so completely that he can describe it with a set of numbers absolutely, essentially, may not find that the give-and-take is a possibility. I think it is, personally, but I think a lot of engineers would have a real difficulty with it, and I think that's probably one reason why more engineers aren't in politics. I don't think they could stand the heat; they couldn't stand the sort of things that a politician has to do. You can criticize a politician for the things that he does but basically some of those things he has to do in order to accomplish certain things that he has set out for himself—he has no alternative. Because he just can't go out and just say, "This is the way we're going to do it." Even Hitler couldn't do that.

So, I think that the engineer has a place in things; I think he needs to make himself known; I think he needs to describe and inform what the opportunities are and so forth; but, I guess, I'm not real sure that he is in the strongest position in the give-and-take and the rough-and-tumble part of politics which are all a matter of judgment.

What about the training of engineers? Should an engineer have a broader base of education? What do you think?

Perhaps. I've been arguing that the engineers need to broaden themselves in their education and so forth. I've talked to the electricals over here at the university several times in past years about that, and

when I sit down and look at the things that they're taking and the length of time that they have for their training, they're doing a pretty fair job of broadening themselves, really. It's hard to throw rocks at their problem.

The thing that is wrong with their program, in my view, is that they ought to get a bachelor's degree in engineering at the end of four years and then they ought to go to school another two or three and get a professional degree, or maybe a doctorate or something, in some specialty. There is no way that you can really train a competent technician and broaden him in four years. There is no way it can be done. I think they do a surprisingly good job with the program that they have. But that program...there are so many things that they have to learn, that they have to have. They can't learn it after they get out. You can't do it in four years.

So you encourage engineering students to go on for a higher degree?

Well, I think so. Basically, I think the system is wrong. I think that we ought to train them in fundamentals the first four years. I'm not talking about the fundamentals of engineering; I'm talking about the fundamentals of psychology and a whole lot of other things including mathematics and physics and chemistry and political science and philosophy and psychology and a whole lot of other things. Give them a real broad background the first four years, and then let them take their electrical or their civil or their mechanical or their chemical or something else in the last couple of years. Well, we're not doing that and I don't think we're going to change right away.

Where do you see the future of CH2M HILL? More geographic expansion, more mergers?

Oh, I don't know. I'm inclined to think that there's a limit to how big an organization can profitably get and I really don't know where that size is; but I would guess that the big percentage growth in the firm is passed. I may be wrong, but I would guess that after a firm gets so big, there may not be that much advantage to getting a lot bigger; so maybe in terms of manpower, that's as big as it ought to get. I think that there will be a shift in the emphasis. I think there will be more emphasis in the energy area. I think there will be continued emphasis in the environmental area. But I'm not sure that I think that the firm will double in size again in the next five or ten years.

The new directions will be in the energy field? Maybe in hydrogen?

Well, possibly. Though I'm inclined to think that that's a few years off. I would guess that the hydrogen bit isn't going to come into its own for the next fifteen or twenty years. I think it could, but I don't think it will. We have enough fuel to get us through and no one wants to change. It is cheaper, it really is. It's cheaper to put a converter of some kind on the car so that you can get rid of the pollution than it is to fuel with hydrogen. And, you know, people are used to buying their fuel at the service station

and carrying it in a tank as a liquid, and they're not used to handling it in other forms.

Are you going to buy a hydrogen-fueled car then?

Oh, I think there are some now. There are some now. As a matter of fact, I think all the cars of the Bank of America in San Francisco are fueled by alcohol.

I heard about that.

You know, there are some people who are doing some things about [hydrogen-fueled cars]. But it is a far cry to converting a whole economy. That's really quite a job, and so I just don't think it's going to happen. I had the picture, ten years ago, that we had an energy problem which was going to be disastrous; that there really was going to be a shortage of fuel; and I didn't think that we could afford to have a shortage in fuel. That's why I thought some other form was going to come due. Well, we really haven't had a shortage in fuel. We are paying through the nose for it but we're still using that. And I think that will continue now for... we've had the period of inflation to pick up the cost of energy and have gotten it up to where the cost is equal to its value, and that probably will sort of be in a plateau for now and we will just go ahead and use the petroleum products that we have, and then when our shortage comes again, a major shortage, why then we can move in some other direction.

But these things are so difficult to change, you know, once you have the method of storing fuel. Fifteen or twenty years ago I was talking about using alcohol as a fuel, and I found out immediately that one of the big problems of using alcohol as a fuel is how do you store it. I didn't think there was any problem storing alcohol, and I should have, because I used to work for the Shell Company; I drove a truck for them, and the bottoms of all of our gasoline tanks were full of water. They always had water in them; if you took the water out, it would get back in; there is a certain amount of water in the fuel and it just settles to the bottom and you leave it there. And you store gasoline over water. You just do; everybody does.

Well, you can't store alcohol that way. The gasoline and the water won't mix; the alcohol and the water will. With alcohol, you've got to get the water out of there and keep it out, and our techniques of storing are not up to that; we can't do it yet. There is just a very simple problem of using alcohol—how do you store it? You can store it in a bottle. That's easy. But try storing it in hundred thousand gallon lots and that's tough because you get water in it.

What are your goals for the future? Are you going to research into more of this type of thing?

No, I don't think so. My interest in the future is to just take on small, special problems that the office has; just work on them as projects, helping somebody else who is a project manager for the project and

getting it done. I don't really have any plans for trying to change society. I don't think I'm going to make the grade.

Well, you could be involved though.

Oh, sure. But right at the moment I think that the significant thing that we need to do is to increase our capability for generating electricity, and do it as cheaply as possible without jamming up the environment, and using that as a means of generating the portable fuels that we need such as hydrogen. And right now that is not really very easy, it is not easy to do at all. You know, wherever you want to put a generating station, someone doesn't want it there.

How have you been able, through all these years with the firm, to meet both the needs of a very demanding job and of your personal life?

Well, something has to give; sometimes it's one and sometimes it's the other. I think we've all tried not to give up too much of our personal lives for the office and yet I think we've all had to do those things that had to be done in a timely fashion. Sometimes we've had to work on the weekends, sometimes we've been able to work in the evenings and not work on weekends, and so forth in past years. I think we've been able to balance things out pretty well. I'm sure that our personal lives and some of the things that you would like to do have suffered some and, yet, as I look back on it, we've really spent a lot of time with our kids and with our families. I think we all have; I don't really think that any of us have suffered unduly in that respect.

How many children do you have?

Three.

What are their names?

Well, the oldest one is a girl. Her name is Gail. She is an art teacher at Madison High School in Portland and is a part owner in a restaurant in Portland that she started, called The Silver Garden. The next one is a boy, Tom. Tom lives in Bend. He's part owner of a small construction firm that is having a tough time existing right now in the recession. The only work they can find to do is either in Wyoming or in Arizona so he is gone an awful lot of the time. The youngest one is Rich. He is a fighter pilot in the Air Force.

As I recall, when you were much younger, you wanted to join the Navy. Your son...

No, he couldn't stand the Navy.

Oh. (chuckle)

He'd enjoy flying for the Navy but he likes—he has his problems with the Air Force and he gives the Air Force a lot of problems—but he loves to fly and he is very proficient at it. He is a good pilot. He's an evaluation pilot

for their squadron. That means that, when one of the airplanes has a major problem and goes in for an overhaul, he has to fly the airplane first like a test pilot would. So he gets lots of hours.

I can imagine! It's interesting that two of your children have started their own businesses just like you did back in 1946.

I'm not sure that that's...

Any correlation there?

I don't know whether that's true or not. Probably. Yes, it's probably true. They all enjoy a certain amount of being able to do their own thing, and you can come closer to doing that when you are an employer than you can when you are an employee.

What are some of your hobbies and avocations?

Well, they change from time to time. I used to be quite an avid photographer. I had a lot of equipment and I took a lot of pictures but now I'm sort of out of that. My wife built a darkroom for me, and I haven't been in that darkroom for five or six years I think. Oh, we ski. We used to ski a lot more than we do now; we're getting to that age where it's not as easy for us to do that as it used to be.

Is that downhill or cross country?

Downhill; we're too lazy to do anything other than ride up a hill on a chairlift. And we like to travel. As a matter of fact, my wife and I are going to go around the world, starting about the first of April of this year. We are going to Japan; she's never been to Japan. We are going to spend two or three weeks in Japan, and then we are going on around the world to Frankfurt. In Germany, I'm going to spend ten days going through the area where the Battle of the Bulge took place in World War II. And then we're coming home. And then about a year from now, or a little less than a year from now, maybe next fall, we're going down to Africa and spend three or four weeks down there looking at what remains of the wildlife of Africa, and my wife wants to go through Egypt. So we have those plans.

Sounds like you're finally going to retire then.

Well, in the meantime, we'll get back to work. Then for a number of years, I have taken the month of August off and we have a boat that we take up into the San Juan's and up into Canadian waters and spend a month poking around, trying to keep the boat off the rocks and it's a lot of fun.

Sounds like you are going to have some well-deserved vacations.

Well, I don't know if it's deserved but it's fun. We enjoy it.

That's good. My last question is how can historical information about the firm's past be useful today?

Same way that history is valuable to society. I think it always helps you in making decisions as to where you are going to know where you've been.

And I guess that's the most valuable part. I think different people would have different feelings about that. And my inkling would be that it would be more valuable to me than it would be to somebody else. I can remember when I first went to work, I was just very interested and spent a lot of time finding out how Stone and Webster, an engineering corporation which is a gigantic corporation now—they owned about twenty percent of all electric utilities in the United States in 1930—I was interested in where did they come from? How were they formed? What was the background of the people?

So you could use it with your own people perhaps?

Not even so much that as I was just curious. Where did they come from? I'd like to find out more about them. I did the same thing about Jackson and Moreland. I'd sit down when I had the opportunity and talk to Moreland about: how did you get associated with this? How did Jackson get associated with this? And so forth.

Isn't it unusual for an engineer to be curious about such things?

No, I don't think so. I am a history buff, you see. Those things are important to me and I'm curious about them. Not everyone feels that way but I guess I tend to feel that you're stronger if you know where you came from.

Right now I'm trying to find out more about my family history and so are my youngsters. We've been running around here and digging out the newspapers over in Eugene and going through the cemeteries over there where they are all buried and the old family Bible and all this stuff. You know, everybody in the family is interested. My wife is interested; the boys are interested. I don't think Gail cares so much about it. She just says, "Gee, you're wasting your time. There are more valuable things for you guys to be doing." But Tom is interested and we have fun doing that. Tom was a history major here at school. That's what he graduated in was in history. I don't remember whether Rich was a history major or not; he might have been. But anyway, that's just, I'm inclined to believe that it's important for you to know where you came from.

Do you think these oral histories serve part of that purpose then?

Oh, I think so. I think that's what they're for. I can't think of another purpose that they would serve other than to try to give people a feeling for where they came from. Because at any time, all of the people in the organization to some degree are a part of that organization and they can't help but feel more comfortable if they knew—they may not want to take the time and the effort to find out—but they'd really be more comfortable if they knew where they came from. I'm sure that's true. But some of them will feel it very strongly. Some of them will care a lot less. I just happen to feel that it's very interesting. Maybe not so much important but very interesting.

Good. Is there anything else that you want to say that I haven't covered?

I've enjoyed it. It's been fun.

Well, I have too, believe me.

End ...



Burke Hayes