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Company Affiliations: Canadian Grain Commission—Grain Research Laboratory

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Summary: Former director of the Canadian Grain Commission's Grain Research Lab Keith Tipples discusses his career, the role of the GRL, and its contributions to Canada's grain trade. He begins by describing his path to the GRL through baking school and a PhD in the UK, and his specialization in cereal grain research. He explains the GRL's original purpose of complementing the CGC's inspection division, studying and delineating the qualities of grain varieties. He shares some of the Lab's other roles, like making grades understandable to customers, working with marketers on contract wording regarding quality, developing new varieties with plant breeders, accepting or rejecting new varieties on the Canada Expert Committee on Grain, and publishing crop surveys. Tipples describes major changes over his career, like the Lab's development of rapid grain protein tests and moisture tests, customer demands for different grain characteristics, growing fears of chemical residues, and computerization of the Lab. Throughout the interview, he shares memorable stories from his career, like finding snow while unloading grain in the Philippines, and visiting Japanese bakeries and flourmills. He also discusses the GRL's connections with other Canadian organizations to promote Canadian grain, like the Canadian Wheat Board and the Canadian International Grains Institute. Other topics discussed include the world-renown of GRL scientists, memorable years of crop damage, other grain-related labs around the world, the challenges of making scientific data and processes understood to laymen, and his admiration for the Canadian producer.

Keywords: Canadian Grain Commission (CGC); CGC—Grain Research Laboratory; Grain research; Grain science; Cereal grains; Grain varieties; Grain inspection; Grain grades; Visual grain inspection; Moisture testing; Protein testing; Grain drying; Grain cleaning; Grain sampling; Plant breeding; Grain variety registration; Grain statistics; Crop surveys; Grain farmers/producers; Grain export destinations; International trade; Grain marketing; Computerization; Canadian Wheat Board (CWB); Canadian International Grains Institute (CIGI); Flour milling; Baking; Spillers UK; Japan; China; Philippines

Time, Speaker, Narrative

MC: I am talking with Mr. Tipples in his home here in Winnipeg on Wednesday, May the 1st, 2009. And it's a beautiful sunny day, a little cold. We'd like to get in the garden and on the golf course, but today we are going to talk about your involvement in the grain industry, and I guess that's my first question. Could you tell me a little about how you got involved in the grain industry, maybe what sparked your interest? You could—as you were telling me about your educational career before we went on tape—you could have gone many different directions, but you chose to work in the grain industry. Tell me a little bit about how you got involved and what sparked your interest.

KT: I started really backwards. Most people would go to university and specialize afterwards. I specialized first in the sense that I was born in England in 1936, and my dad was a baker. In fact, his dad was a baker as well. I really didn't know through school what I wanted to do, so after I did my ordinary level school certificate, I left school at 16, went to technical college in Cardiff to study baking full time, two years for City and Guilds and national diploma, with the object of going into the baking industry.

Having got that far, I had an opportunity to go to the London Borough Polytechnic and do a higher national diploma in baking and food technology and experimental baking, this sort of thing. The first year of that involved doing three advanced-level subjects, which I would have taken at school and that then gave me university entrance qualifications. I looked around for a university course that sort of fitted the baking background and found an applied biochemistry course in Birmingham. So I did three years, got my BSc and had the opportunity to stay on and do a PhD.

I got involved with a large flour milling company, Spillers in the UK. They have a big research centre in Cambridge. A couple of their senior scientists were alumni from the same department that I did my BSc in, and they were instrumental in setting up a scholarship for somebody to do a PhD. I worked for Spillers on some aspects of wheat and barley, wheat lipids for my PhD. I got that in 1962. That was a good year because I got married as well. At that time, most people finishing a high degree looked for somewhere to go on a post-doctoral fellowship. I looked through the scientific journals to see who was doing research in the area of cereals and all the stuff I now had the background in and found that the Grain Research Laboratory [GRL] in Winnipeg was the world's leader in scientific research on wheat and other cereals. So I wrote to the then director, Dr. Anderson, and didn't get much of a reply. In fact, I had arranged to go to Peoria with the USDA on a post-doc. Then I got this letter from Dr. Anderson who said, "We have this National Research Council fellowship available and that it's yours if you want it. But, please put an airmail stamp the next time you write because your letter came surface mail and took about five or six weeks to arrive."

So, we thought, now Winnipeg sounds like and interesting place, so we came out. My wife was six months pregnant. Came on the Queen Mary, took the train all the way up the Mississippi, arrived in Winnipeg early January. It was quite a time to come, but we hadn't told them, we said we were arriving at a certain time. We didn't know there were two stations. There was the CP and the CN,

and they both had trains arriving at that time. So they stationed a scientist at each. But they knew it was us because this couple came off and the lady was holding an umbrella, obviously an English couple. That was the introduction to Winnipeg.

Stayed for a year and worked on some amylase enzymes, and at the end of the year, they were looking for somebody to head up their milling and baking research. Of course, this was right up my street. I was offered the job and was head of applied wheat research for 16 years. That was through the '60s and '70s. And then in 1978--. Let me backtrack. When we arrived, Dr. Anderson, who was very well known, famous scientific figure in his day, he had been the director of the GRL for over 20 years. He was just retiring, and they were just holding the interviews for choosing the next director when we arrived. So my immediate predecessor, Dr. Norman Irvine, got the job. Then in 1978, he retired, and in 1979, I was persuaded to become director. I didn't want to. I was enjoying life as a research scientist, and there were a lot of headaches. Anyway, I became director in 1979 and never regretted it. It was very challenging, and then I retired in 1998. I know it was August—no, July—because the same week on the Monday our only granddaughter was born, and on Friday I retired, so it was a good week to remember. So that's how I got into cereals and research. I specialized first.

MC: Your father must have been very proud to see you go in this direction.

KT: Actually, yes, he was. It was a little embarrassing sometimes. You know what parents are like.

MC: Was he ever able to give you practical ideas that you didn't learn in school?

KT: Actually, I had occasion to go over to England in 1966 for quite an extended visit because the British Milling and Baking Research Association in Chorleywood in England had developed something called the Chorleywood bread process. This was a process with high-speed mechanical development that enabled them to use a lower protein wheat to make the same bread or to make a better loaf of bread from the same flour. And, of course, it was politically advantageous for them to use more English wheat and less imported North American wheat. So, we went over to look at a number of bakeries that were using this new process, including the bakery that my dad was at. That was a bit of a link up. I managed to get some samples sent over from him and so, yes, we enjoyed that relationship.

I also had very good relationships with the Spiller's people where I did my PhD. Over the next 30 years, I had good, close relations with some of their scientific people. It was very valuable because it is very difficult to get good samples, and in the grain industry, any work that you do is only as good as the sample and how representative that sample is, particularly in our laboratory in some of the work which I will talk about in a minute.

How do you sample a grain car or a boatload or a farmer's truck and get something that is truly representative? Anyway, in the same more global sense, because Canadian wheat relates to American wheat, or Russian wheat, or Australian and so on. And back in the early '60s, English millers were milling a very wide variety of wheats in their grist. I had this arrangement with Spillers that they sent me a really good average sample of all their receipts during the year, of Russian SKS, of Australian prime hard, of you name it, 12 different types of wheat so we could do a very detailed foreign cargo survey which we did every year. How does our wheat relate to these other wheats? That was always a good relation. And then I worked one summer before I came out here at Chorleywood and really got to know some of their people pretty well and that stood us in good stead later on.

MC: You were very involved with Spillers and your dad was very practically oriented to baking industry. How does that sort of training compare to new PhDs coming in? Was that unique?

KT: No, I'd have to say it was unique in a sense because it was very useful for me during my research years because rather than getting carried away with all the theoretical stuff, I wanted to establish the practical basis. So a lot of the work we did in baking research involved looking at the baking process and particularly the mechanical development, dough development and try to understand how the more scientific side of that, but you have to understand the practical part of it first. So that was very useful, and a lot of the work that I did on amylase enzymes again was related to what was happening in the field and how does that affect the baking? But maybe I should say something about the GRL.

MC: Before we get to the GRL, I just wanted to follow up that point on the importance of practice in your research, and you alluded to the idea that perhaps that's not how new PhDs are trained these days. Do you think there needs to be more practice in their training?

KT: Not necessarily because most PhD programs are not designed to turn out the finished product, but to not necessarily be the expert already, but then to be able to apply themselves into a particular field or whatever. The uniqueness that I talked about really meant that I already established my focus. It was a case of embellishing that--. No research we had over the course of time--. About a dozen research scientists which I would be directing—a wide range of different types of people, some characters—some were more difficult than others to direct. Bring them back to--. But the advantage of being a research scientist at the GRL unlike in a university setting or somewhere else was--. So for example, the guy that was in charge of oilseed chemistry, for example, would be expected to be a world, internally-recognized expert in his scientific field, oilseed chemistry, to publish papers in peer-reviewed journals, and that's establishing his credibility. But he is also responsible for the crop surveys and doing those properly, for looking at the methods that he used to evaluate quality and to make sure and maybe some of them need to be invented or polished up or whatever. Also, if there is any work to be done with the breeders on new varieties, to be the person there. He's also got to be the person to work with the inspection people on grading factors. What's the effect of green seeds? He's already got his focus.

There is a certain amount of leeway that you can give them in the basic sciences. So, whether he decides that he is going to do some work on chlorophyll or on the specific fatty acids or whatever it is, or [inaudible] is less important than the fact that he maintains this expertise in oilseeds chemistry. Similarly for the person that's in charge of durum wheat research, similarly the person that's looking after residue analysis, analytical methods development, barley research. So, each of the scientists has that focus which is also unique to a degree because most other researchers don't have that focus. They can go off when something comes up, and that's very interesting.

In a university you are training. Well, you're doing two things. There are the profs who are establishing themselves. They have a base of expertise, and then they have the grad students and so on to supervise, and that's going to help to build up--. They're going to have joint publications. Whereas the grad students are being trained to be researchers, basically. I think it works well. We have a good relationship with the university people here and university people worldwide, also with other grain research institutes. We're probably one of four or five in the world. Chorleywood, the Bread Research Institute in Australia. There's some work done in the US, although it's a little more fragmented. But we have good relationships. [Inaudible] interested in their own publications, don't share anything with anybody else, don't make me meet anybody or talk to anybody.

MC: Are you alluding to that's how academics in universities--?

KT: No, not at all. No, no. I guess I was alluding a little bit to--. I used to be involved in some committees for scientist's promotion exercise, and this is within the government, within Ag Canada. So the promotion exercise would be to go from a Res 1 to a Res 2 or Res 3, whatever, this huge document and committee structure and this sort of thing. You got a real feel for some people who were good collaborative researchers as opposed to the ones that were loners. There's one in every crowd.

MC: Are you suggesting that in the people that you hired in your setting, there was a lone researcher?

KT: Yes, often it doesn't become evident until they have been working for a while. But you hope that you who are hiring people who are going to be good collaborators. They have to be. They have to be. It's in their best interest. And not only collaborating with other scientists but be able to talk to other elements of the grain trade, and that was very important for us because we had to be very careful that we weren't viewed to be in this ivory tower and these guys with white coats. We can't talk down to you, particularly when we are dealing with grain inspectors, the grain inspection division, because the most important part--. In fact the main rationale for having a grain research lab in the first place, when the lab was set up in 1913, or something like that—it was very small in those days, called the Board of Grain Commissioners for Canada as they were then—in particular the grain inspection.

The grain grading system has evolved, or it did evolve quite markedly actually during the time that I was at the Lab. When I first went to Winnipeg, the grading system was such that No. 1 Hard was the top grade. That was something that would win a prize. Every kernel looked like it had been polished, very uniform, the perfect specimen. Then there was No. 1 Northern, that looked pretty good too. No. 2 Northern didn't look quite so good, but it was still pretty good. No. 3 Northern, No. 4 Northern, we had all these grades, and then there was No. 5 wheat, No. 6 wheat. What had evolved was the system was essentially a visual system, granted. It's based on the fact that you can recognize the varieties, so if the wheat sample looks good, it is good. But does it have to look perfect?

So a large part of our responsibility was looking at factors that can affect the appearance of grain, what can happen in the field or in storage that can affect the look of the grain. If you take wheat as an example, the major ones are frost damage and immaturity. So what is the effect of frost immaturity? What about when you have wet harvests? You get bleaching and weathering and mildew and sprouting and this sort of thing. To what extent is that going to affect the quality? What about fusarium head blight and [inaudible] and the mycotoxins that can develop such that we put as much grain as possible into the top grades? Knowing that it's top quality, good quality, but make sure that the real bad stuff doesn't get in. So to what extent can you set tolerances?

There were some key milestone years that I can recall. With frost damage, the big year was 1974. I think something like half of the total wheat crop had to grade Canada Feed. It was pretty badly affected by frost. However, there are different degrees of frosts and its combination with immaturity. Some light bran frost, if the kernel iss fairly well developed can actually improve milling quality. But no, you downgrade it. You may put it in the [No.] 2 CW Red Spring and not in the [No.] 1. But recognize that that type of damage or appearance is not too bad, whereas severe frost damage makes the kernel overly hard, extremely hard to mill. It's very poor, and in 1974, we had a lot of that stuff. And the Wheat Board was trying to segregate some of it for sale, and if you put the right proportion in the grist, wheat grist, 5 or 10 percent, something like that, and the price is right, fine. But don't go and buy it thinking it's a good deal and mill at 100 percent. 1982 was the other big frost year that we had. About every 10 or 12 years is a big frost year. So that gives an excellent source of samples with frost. Even work out in the field with portable freezer units to look more scientifically at frost damage.

So, frost damage was one. I can remember the wet harvest of 1968. I remember for two reasons. Something like a half of all the wheat, at least a half, had to be artificially dried. It was graded tough or damp, meaning it had to be dried or otherwise it was going to go off. And there was a shortage of artificial dryers. The big ones at terminals could handle so much, and then a lot of these dryers appeared that were used by farmers and used at primary elevators. The problem was that if you dried wheat improperly--. If you cook an egg, you can't whip the egg white up any more. And if you cook the wheat kernel, the gluten is going to be altered so it won't make a loaf of bread anymore.

So, this was very hard to detect because you couldn't see it. So, what we had was a big program—this was the 1968 harvest, so this went into '69—of testing. We had to have sample before and after drying so that we could compare the two samples. We had to mill each of the two samples into flour and then use a particular recording mixograph test to see the extent to which the gluten quality might have been affected. Then we would give an assessment whether it was no damage. Had to get the grain industry to take that material out of the--. But that was a huge thing. We had 22 casual technicians working just on that. At one stage, we had 1,000 samples a day coming in.

MC: This was to try to respond to this wet harvest and make a decision about that year's harvest?

KT: To make sure that the dryers--. It wasn't so much that we could do much about the wheat, but we could go back to the person doing the drying and say, "Reduce your temperature or you'll damage the wheat. This dryer is--." And there was a particular type of dryer, a particular make of dryer that was causing a lot of problems. That was one element.

MC: You had to be able to respond that quickly to this issue.

KT: Yes, and also, we had to develop the testing protocol to be able to do this.

MC: Pretty fast turnaround?

KT: Well, that was quite a headache. I can remember Vic Martens, who was then the executive director, actually secretary then, of the Board of Grain Commissioners. We'd meet every day on this stuff. And I'd say, "No I can't handle any more." "Yes, you can. Yes, you can." And surprise, yes, we did.

So that was an interesting year. But it was a milestone for another reason. Before 1968, sprout--. And people had never heard of alpha-amylase activity and the amylograph test and falling number and this sort of thing, and the grading system really had no way of properly assessing alpha-amylase activity. But worldwide, people weren't concerned with the amylase enzymes or anything else. What happened was the Japanese market, which was our highest-quality market for wheat, very demanding, they made a particular type of square Pullman loaf in a square-lidded pan, and because of the formulation they had, they had potassium bromate, and the least little bit of amylase enzyme, which would break down starch and start to liquefy it and you get a key-holing, caving in of the bread, and they just went crazy. And they got burned quite badly.

MC: Not in the literal sense.

KT: Not the literal sense. The loaves didn't burn. They were very upset with both American wheat and Canadian wheat. American wheat more so than ours, actually. And they over-reacted. And they said, "We want wheat that is very, very sound—very high falling number. It doesn't matter what that means." And the irony was that you need some alpha-amylase in your baking formula because during fermentation, you want some of the starch to be broken down into sugars so that the yeast can maintain its fermentation. So, you need some. In fact, the baker is going to add some anyway. The irony is there's no deleterious effect in most baking processes, except for this Japanese Pullman thing and because of that formula that they use. There's no ill effect, but they demanded high falling number, very low alpha-amylase, very sound wheat, and the rest of the world started to jump on the bandwagon.

I can remember a Chinese group coming around the lab and they said, "Dr. Tipples, do you think we should be asking for a high falling number wheat?" I said, "No, no. You actually are much better off. You're buying [No.] 3 CW Red Spring. That's a really good deal for you, because the protein level is right for your processes, and you need some--. Don't worry about that."

But it's very hard to get over. Like the government saying, "Trust me. There's no truth to the rumour that alpha-amylase is bad for you." But the further irony of what that relates back to is, I forget the year now, in the '20s, Dr. Burchard, or Dr. Burchard's predecessors—one of my predecessors—was fired from his job because the Western Standards Committee. At that time, it was normal, just for show, to bake loaves of bread, loaves of bread from each of the grades. They had [No.] 1 Northern, [No.] 2 Northern, [No.] 3 Northern. He kept coming up with these loaves of bread, which showed that No. 3 Northern was better, made bigger loaves than [No.] 1 and [No.] 2. Back in those days, they didn't realize that with the test-baking process that they were using, you had to add some malt or alpha-amylase. Otherwise, the yeast is going to run out of food, and you are not going to get the full volume. Whereas the [No.] 3 Northern then was great. It had a little bit of alpha-amylase in it, a bit of sprout damage that year, and it made much bigger loaves. My scientists always give me a hard time on this one, but my normal answer to any question is always, "It depends." Is hard wheat good or is hard wheat bad? Well, it depends. If you are making cakes and cookies, you want a soft wheat.

Which reminded me back even before the guy was fired, the GRL was very small, just a few people. One of the technicians of the time was a venerable, delightful fellow called Chauncy Alcock, who subsequently was, at the end, head of market development at the CWB until he died a number of years ago. Anyway, he was a technician at the GRL, and at that time, they were trying to determine limits for straight grade, meaning at what moisture content can you keep wheat and it's safe as opposed to it's tough? So, they needed to set limits. They'd just opened the Panama Canal. And you can imagine this, the first boatload of wheat that went from Vancouver down through the Panama Canal across through to Europe. He sailed on it, and he was armed with moisture meters and thermometers. He had this very—I wish I could find a copy of it—this very long paper describing all the measurements.

And that was a good basis because this wheat was going through all sorts of hot weather during the [inaudible] for a long time, and the boat was subject to piracy at one stage, too. There was a fire onboard—all sorts of exciting stuff—much more exciting stuff than the boring old moisture content, temperature. But the journey across the Atlantic, I think it took about a paragraph. "No readings were taken because of inclement weather." We had visions of poor old Chauncy being violently sick and not able to do anything.

But interestingly, that work was the basis for which the straight grade limits were set. Now, that has to be modified a little bit because if you are going to send wheat over somewhere to a very hot country--. Which reminds me of the time I was in the Philippines. I was doing some marketing development travel for the Wheat Board. I was in Cebu. It doesn't matter where. I was visiting a flourmill, and they were receiving their first shipment of Canadian hard red spring wheat for a long time. I was sitting in the middle manager's office chatting away, and the guy comes running in and he is so excited. He says, "Oh, the unloading spouts have all blocked up!"

So we went onboard and what had happened was that--. And I was there to be able to identify snow. Now, it was probably pushing 100 degrees. This wheat had been cold, loaded in January in Vancouver and for some--. What must have happened was that there must have been a sudden snow. It was about that much off the bottom, and then they loaded grain on top. Well, associated with this layer of snow was some sprouting, big sprouts that had developed during the voyage. I still have pictures of these guys coming up from the hold with this big layer of snow with the sprouts sticking up. It was amazing. And the poor guys in their loin clothes, or stripped down, they could only stay down in the hold because they were shovelling to unload this stuff. But it was very cold down there. It was like Winnipeg last week. But it points out the important relationships between grain and moisture and temperature.

One of the major responsibilities of the Lab, the basis, the responsibility was to understand, try to understand what is quality? What does quality mean to the person who is buying the wheat or barley, or whatever? What does it mean to the person who's processing it—the miller, the baker and so on? And how can you put numbers on that will mean something to them? How can you come up with meaningful, laboratory, small-scale tests that will give you a meaningful and accurate picture of the quality? You don't want to be doing things--. I've got these numbers and then you find the miller says, "That's a load of rubbish, you know, because my milling doesn't show that at all, my baking, whatever." So what can affect quality and to develop methods.

Protein content is also very important thing over the years. I think it was about 1927 the GRL first established a protein survey for wheat. Every year since then, we go out and get literally thousands of individual samples submitted by primary elevators, country elevators. We'd do individual protein tests from those. So, we'd end up with, or we used to anyway—less significance now with protein segregation—but protein maps showing where the high protein areas were. It's very interesting because it really illustrates

the variability from one area. So protein content can range from 9 percent to 20 percent for the variety grown in different locations. You'd deliver it to a primary elevator, and the rail cars might range from say 10.5 to 11 percent, up to 18 percent.

And then in the old days before protein segregation and over the course of our protein surveys, we saw about three 20-year cycles going from low to high. By low, it's been as low as 12.5 percent average. It's been as high as almost 15 percent average, with a long-term average of 13.5 percent. So in a year of high protein, they'd complain. And we'd say, "Yes, there is no guarantee. You are still getting good wheat." Another part of our work involved not just testing protein content by the traditional method which was the Kjeldahl procedure, laboratory thing with acids and alkalides.

MC: I used to do those tests as a lab tech.

KT: So you know all about that. That was the basis—that still is the basis—for calibrating the rapid instrumental methods. But during the 1970s and into the '80s, the Lab did a lot of developmental work on getting the infrared reflectance meters in place that would work and were reliable estimates of protein content. Now before that, and even before I arrived, there'd always been the [inaudible] "How can we take the higher protein and the lower protein and segregate them?" The initial work we did was to get rail car samples submitted on loading from the primary elevators sent to the Lab to do a protein content, get the result to Vancouver before the rail car arrived hopefully, and on the basis of that protein content they would bin into separate bins. Now that only worked to a limited extent because the cars got there before the result got there and all this sort of thing. The next move was to try to get more rapid testing and then testers operational in the terminal elevators.

MC: The terminal, you mean in Vancouver?

KT: In Vancouver and Thunder Bay.

MC: Was that the infrared technology?

KT: That's right, the infrared reflectance, so called. Then the segregation was interesting because when you test for protein or when you test for anything and you get a result 13.0, but it's not 13.0000, it's 13.0 plus or minus 0.15, even in the best lab, the best circumstances. Now you can't explain that to the non-scientist, you can't explain it. "How come you can't get it right?" And with any test there's experimental error.

What it meant was if you segregate rail cars on the basis of protein content, and you say, "All right, I'm going to get 14.5. I want to get 13.5, but to get 14.5, I really have to aim for 14.6 or so because I don't want to miss because there is going to be some variation

in those cargoes." But if you say, "All right, to get to 14, I'm going to put anything that is 13.8 and higher up there because I know then that it's going to turn out right." But there is going to be some that you put up there at 13.8 and you find it wasn't. It was 13.6. And the lower one, the reverse. So what we found initially was that we did all the individual proteins and the segregation was coming out different, so we had to make an adjustment for this. And statistics is, you know as a scientist, is tough. And then you throw one of your darts and they come out. They missed the board, but they are all grouped together. You're very precise, but the accuracy is way off. And the same sort of thing working with--. And latterly, during the '70s and '80s particularly, the buyers became very demanding on toxic residues, unacceptable levels of pesticides, mycotoxins, heavy metals and so on. So we--.

MC: When was that, the '80s, did you say? Approximately?

KT: It would have been from the mid '70s on. By the time I was director, we were getting into some big contracts, certainly in the '80s with the Japanese, because they wanted to know, and they were paying us big bucks, to find out exactly. Plus, the Japanese Food Agency was demanded this.

MC: They had Minamata and that then, the scare. That was when? I forget that now.

KT: Anyway, the interesting thing with residues is that you cannot say, "Zero". There is no such thing as freedom from. I can remember the Chinese back in--. One of the important support areas that we carried out was with the Wheat Board and other marketing agencies, because they tended to get into contracts, and the buyer would say, "Okay, I want you to guarantee freedom from this, that, and the other thing." Like the Chinese wanted freedom from mercury. Well, sorry but we know that there's eight parts per billion, base level. We had to agree, "All right, you want to say 20, we can certainly guarantee that. But you can never guaranty freedom. There is no such thing as zero." So, you have to have these tolerances. But that then puts a heavy load on the analysis and the smaller the amount. If you can hit the right answer within 50 percent of the right answer, you are doing very well, which sounds horrendous. You know that you could be that much out.

And then you can't talk about parts per billion. One part per billion sounds, "Gee, there's a lot there, right?" Well, one part per billion is something like one second of time in 32 years. "Oh," you know, "that small, eh?" Then you get into this business of, "Oh, we found traces." Okay, "What do you mean by traces?" "Oh, a few parts per trillion or few parts." Very interesting here. So we had to develop expertise in being able to do proper analysis.

MC: Was it the role of your group to educate the customers—the Chinese, the Japanese and so on—about what this means?

KT: No. Well, we were providing support to the marketers who were coming up with contracts and hoping that the marketers would come to us first with some wording, rather than afterwards, and I said, "Oh, god, you didn't say that! Oh gosh!" But I, you know, I won't go into that one.

MC: Marketers may not be trained in statistics.

KT: Well, there's a different set of statistics for [inaudible]. Then the work we did with varieties and working with the breeders on potential new varieties was another pivotal part of the quality assurance for Canadian grain because there we had to be very aware about the quality and what is quality. There's a difference between poor quality for some reason that really doesn't matter what you do, you are going to get a poor product, and different quality which means that you can get a good product. But you are going to have to do things a little differently, maybe mix the dough longer or cut your fermentation time or put some of this in. Well, the processor doesn't want to do that, of course. So the processor wants no surprises. In fact, any buyer wants no surprises. So when we talk about Canadian wheat quality, for example, well there's the fact that the average quality is high or good or acceptable, whatever. Then there's the uniformity and consistency from grain boat to grain boat. They don't want to have any surprises. That is, in a sense, harder to achieve these things because with the protein segregation system, they tend to be drawing from smaller areas of Prairies sometimes. In the old days, if you like, they would be drawing wheat from all over, and it would all become averaged out, and so what went down to Thunder Bay--.

MC: Was that because now you have these great big trucks?

KT: Not necessarily, but no protein segregation, so they weren't worried. They were just worried about getting the grades they wanted and where those grades were available and so on. Now, if they want to source high protein wheat, they know the areas. [No.] 1 CW 14.5 might be coming from a much narrower area of the Prairies, and so more subject to this non-uniformity of intrinsic quality characters. Anyways, back to the varieties. So we worked closely through the—it's changed its name over the years—Canada Expert Committee system. So we had the breeders, the disease people, the pathologists, and the quality people. So that the co-op tests that were grown by the breeders across various experimental stations, let's say red spring wheat as an example, we would get samples of the varieties that were grown, and then we would subject them to the normal range of milling and baking and other tests. We would have to rate them relative to the standard.

The standard used to be Marquis, but even when it was still legally Marquis, it was really Neepawa and other varieties. It doesn't matter. What we found in the variety tests was that you might have a much different level of protein content or intrinsic quality in the variety tested than you have in the commercial, so you had to rate everything relative to the internal standards. They would grow not only the experimental lines, but they would have Neepawa and about four or five other check samples in there.

We were part of the committee system to the Expert Committee on Grain Quality, Sub-committee on Wheat, in determining what's acceptable and what's not acceptable. It was a pretty tough decision. We better not be turning thumbs down on something for the wrong reason. Some of the reasons were pretty obvious. Something might be very susceptible to sprout damage or very susceptible to something else. But there were other varieties that had stronger gluten, which in some baking processes was desirable. But what we were looking for was something that would do well over a wide range of processing conditions. A lot of American varieties were coming up that the farmers wanted to grow were overly strong.

MC: Strong, did you say?

KT: Gluten. Essentially in order to develop a dough properly so it will make proper bread, the stronger the gluten means that you have to give it more intensive mixing—higher speed, longer—or much longer fermentation in order to mellow the gluten so it will form the thin sheets and hold gas, and all that sort of thing, whereas the weak gluten won't stand up to fermentation. So, to optimize conditions, you would have to cut down the mixing. You'd have to shorten the fermentation and so on. So it was really quite--. If a variety or a potential new variety had very good agronomic yield, very good disease resistance, and it was excellent except for one factor, to what extent can you turf it or not turf it? So those are very interesting days. The discussions we had with the breeders and the agronomists and the producers as well.

MC: And everybody having a different vested interest in a way.

KT: Yes, I can remember every now and again, about every ten years, there would be some new varieties which the coffee-shop talk would indicate a much higher yield for the Americans and, "Why can't we have them in Canada?" Whether it's Red River 68 or Solar, it doesn't matter what it was. I remember going to one agricultural show and I was giving some sort of a talk. There was a lady there and she had this stand and she had these nice-looking loaves of bread. And she's saying, "What's wrong with this?" I said, "There's nothing wrong with those loaves of bread. Great! The only thing wrong with that variety is that it has much lower water absorption. You can't put as much water in." Now for the home baker, that's not a problem, but your international buyer who is expecting to be able to put more water in, and if they put less water in, they can't put that amount in, then they are going to get less yield of bread and all the rest of it. Some quality factors you can't see. The loaf of bread is only one part of it. You can't see all the others.

Anyway, variety evaluation. Then there's the question of, yes, you're not going to be registering just that one variety. It's not necessarily going to take over everything. You are still going to have a mixture. So there's some leeway for a little different strength levels, different levels of hardness. So that was an important part of our scientific support for the industry.

MC: Thinking back on those meetings where you could accept or reject new varieties, did you regret any of those decisions? Either accepting them or not accepting them, that maybe down the tube you learned something different?"

KT: No, no. You know hindsight is wonderful, particularly 20-20 hindsight. All you can do is call the shots as you see them at the time and with the knowledge. The important thing was that we did have the base for our expertise, because the research we did enabled us to really understand—to a very high degree, actually—the various processes, whether it's the milling or the baking or whatever it was, probably as much so or more so than anyone else in the world, so that we could be confident that we weren't just saying, "Well, I think, maybe." That we could stand up and say, "No, because this, or no, because that, or yes, that's fine."

Sometimes things are going to come down to a consensus. It wasn't a one-person decision. It wasn't that I had to make a decision and live with it. It was a committee system because the way it worked would be that the co-op test samples, as an example, of wheat, the sub-committee on wheat of the Expert Committee of Grain Quality would meet for a whole day and go through all the results. That committee was made up not just of our people but people from university, from the milling and baking industry, and so on. So we had a big group of people who could consider--. Now, the data were basically produced at the GRL and some from the U of M as well, but essentially those are the data, and we would make our evaluation based on the group of people who were there. The next day, or on the same day, the breeders would be doing the same thing with their data, and the pathologists would be doing the same thing with their data. The next day, the joint committees would get together, and "Okay, Variety X." The breeders say, "Yes, it's great." Pathologists would say, "Yes. Fine." And the quality would start up and say, "No." We were the bad guys for a while. But interestingly, by about the late '80s, the pathologists became the bad guys. They were the ones that were turning down some of these potential new varieties. But no, it worked well.

MC: And those were committees of Agriculture Canada?

KT: Yes, sort of. The short answer is yes. We'd have about three days of meetings, and there would be 150 people involved in these things because there would be all the breeders, all the pathologists, all the quality people.

MC: That's a pretty big group of people to come to some agreement.

KT: Well, the whole group didn't have to. You also had meetings going on barley varieties, also oilseed varieties, and there would also be the plenary sessions. It was a good series of meetings. Of course, we were always under the gun to get our data prepared on time. It did become streamlined later, and we did make some changes, which helped the system. Those changes don't matter, but

the basic principle is that we have a system in place for making sure that the varieties that are released are the ones that are going to be the most benefit for the producer and are going to give the greatest return. It's not something where--.

MC: And the consumer, the end user.

KT: Well, the end user, yes.

MC: Now you said that you felt that you were a world leader in this.

KT: The GRL.

MC: Yes. What do you think contributed to that, being a world leader? Why were you--?

KT: The specific nature of our field, which was cereals, the high quality of the researchers that we had working at the GRL, the prestige that they developed internationally through the scientific papers that were published, the base of their expertise, and their ability to relate to the real world, if you like, and deal with producers, breeders, and grain inspectors.

MC: That was something that was unique to the configuration in Canada as opposed to why couldn't other countries have done that?

KT: The only countries that really were in a position to--. You really have to go back to the major exporting countries, because the work in England, for example, was only really related to the British milling and baking industries who funded the research, and they would be responsible for developing. A lot of what we did overlapped some of their interests. There was a lab in Detmold, but they were more related to the German milling industry. They did some good work too. The Bread Research Institute in Australia, a little different because they were more funded by their own industry, plus the Australian Wheat Board was involved in that, but we had some similarity. They used to do quality surveys. In fact, they cribbed a lot of the ongoing survey work that we did.

Every year the GRL did a very detailed survey of the average quality of the different grades and levels, east and west, and we published bulletins and those were sent worldwide. And we`d go out and travel. I used to go to Japan every year, and a week after that, and they would conclude their details, their sales. The United States were a little different. The USA have some research labs, but they don`t have the centralized, everything under roof, if you like. The cargo surveys that we do on an ongoing basis, samples of every single cargo that leaves Canada. We make composite samples by grade, and then again, we publish bulletins and that gives

people a true, ongoing picture of what is moving out of country. The new harvest survey is a prediction based on samples, hopefully they are good samples.

I guess any establishment could argue that they are unique because everybody's--. I found as director it was much easier to direct people even though there are research scientists doing a wide range of different activities. We still come back to the quality assurance for Canadian grain and supporting the market, and supporting the grading system, supporting the breeding efforts and so on.

MC: So do you feel that it is a still a leader around the world?

KT: I would hope so. To be quite honest with you, it's 10 years since I retired, almost 11 years, and when I retired, I made the break. I didn't want to become a consultant because that's a lot more work and effort. Work was increasingly interfering with my extracurricular activities. Even though I still keep in contact with some of the people, I don't know the extent to which, I would hope they are still a world leader.

MC: But certainly, you perceived that in your working days it certainly was?

KT: Yes, and that was always--. We got excellent feedback from, well Japan is an example. The major milling company there, the Nisshin Flour Milling Company, were responsible for something like a third of all the flour milling in Japan, which is a lot of flour milling—very high quality standards because in Japan, quality is everything.

I used to get quite, not annoyed, but upset maybe sometimes because the way it would work was the Canadian Wheat Board dealt with the Japanese Food Agency. They negotiated on the basis of the price at the time. I wasn't in marketing so, you know. Don't hold me to task on numbers, but as an example, let's go back 20 years, $200 a tonne. No, let's go down to $160. Let's say $160 a tonne, top-grade Canadian wheat going to the Japanese Food Agency. The Japanese Food Agency turns around. They sell that same wheat to their mills at $800 a tonne. Then the Food Agency used some of the profit to subsidize their own farmers who were making, were getting something like $1,400 a tonne for their wheat. Meanwhile, the mills who were paying $800 a tonne would say to us, "You guys better make sure you really give us the top quality." Not eking out a living, if you like. We certainly weren't making scads of money. But I digress there.

Let's get back to Nisshin because I had some very good contacts over there. The head of the Nisshin technical research centre and I, we knew each other for 30 years. We had a very good relationship. He used to share with us their analyses on all the American cargoes and Australian cargoes they used to receive as well, and also share the results that they got on ours. Then we could compare

like with like. He was a very good supporter of Canadian wheat because they demonstrated, and we talked about this, the extent to which the American wheat was much more variable than Canadian wheat. Again, the most important thing uniformity, consistency, supply. So we knew that we had a very good, that they held us in very high regard. Put it that way.

They believed—and this was important because we had the credibility—when we went over, and we had meetings with millers' association, interested people, we had quality data for the new harvest, and they would trust that because they knew us from the past. They knew that the data we'd given them in the past, when they got the new harvest, yes, because each year is a little different. This year's crop might be a little higher ash content. In milling, it's maybe a little stronger, small differences which for most markets wouldn't matter. So, the credibility was there. The same with the UK people and most of the others.

And you'd see this through the Canadian International Grains Institute [CIGI] which we would supply resource lecturers for and be supporting their programs, and, in fact, do some travel with them sometimes for the workshops that they'd put on. And you could see from many different countries the respect and the credibility, and because we were separate from the marketing agency, this was very important. The CWB is a very distinct and different from the CGC and the GRL. Yes, we provide market support, but no, we do not say what the Wheat Board want us to say. We have to be very careful in talking to customers, obviously, that we don't put our foot in our mouth or put the CWB--. Because marketing is not our business. Quality data, we will talk to anybody about quality and the Canadian system and how it works, how protein segregation works and all the rest of it.

[Audio pauses]

MC: We just took a little break to get a cup of coffee and visit the garden, and we're back again talking about your work. You told us a lot about the different kinds [inaudible]. There must have been some major challenges along the way. What were your major challenges either in your early career before you were head and then again when you were head?

KT: Probably the major challenges were as director involved us being a federal government agency and some of the bureaucracy that was inherent in that. On the other hand, I was very fortunate, or the lab director was fortunate, because our headquarters for the CGC are in Winnipeg and not in Ottawa, so we are away from the Ottawa scene, if you like. The GRL is shielded a little bit from that bureaucracy by the executive director of the CGC. There was that.

Some of the challenges in terms of the grain industry, probably the biggest challenge is always to--. And I can remember we used to go to eastern Canada for the Committee on Eastern Grain Standards. But also, we used to go on some special visits. When I say "we", this would be the chief commissioner, myself, and the chief grain inspector, and meet with people from the Ontario Corn Producers Association, this sort of thing. Moisture measurement is a pretty difficult thing—moisture content. It is done, has been

done, for many years with an instrument that was developed at the GRL called the Model 919 Moisture Meter. It's a capacitance meter. It doesn't matter. It is used in the grain industry, and it works very well for small-seeded grains, meaning wheat and barley, and this sort of thing. But it doesn't work so well for corn. It works, but the error of estimate is much greater. So, for example, if you are measuring moisture content in a sample of wheat—and provided the moisture meter says it's 13.2 percent—it probably is to within plus or minus 0.1 or so, which is pretty good.

With corn, let's say you're measuring 35 percent moisture sample of corn. It could be anywhere from 33 to 37 percent—quite a margin, or the experimental error is much greater. And as long as you accept that, and we're talking about--. Let me backtrack a little bit. They were using near-infrared for corn moisture measurement. But let's go back to the 919. The 919 works, but not that well. So you let it air dry, and then you put it in the moisture oven, and then you measure the moisture content. That's the way to do it. But that takes time, and the trade doesn't have time to do that. They still want to use the Model 919. Well, part of our responsibility at the Lab was to update the calibration tables for the 919. There are different tables for each type of grain. And with corn, and there were a number of reasons, but the calibration might change from year.

The trouble was they were selling corn on the basis of 0.1 percent moisture increments. They had a sliding scale, which is crazy, and yet you're measuring the moisture, and it's good to plus or minus 2 percent. Big discussions, heated discussions with the corn producers. It was either the producers, or it was either the buyers, or the sellers, and depending on the way that the new calibration table came out, it's going to affect, so they'd either like it or not.

We couldn't get over the fact that if you want a rapid method, understand that it is only good to within this. If you want a more accurate result, use another longer method. No, they couldn't understand why we couldn't get it right. The challenge, in a sense, was to get over the message. As I said earlier, this business of experimental error and standard deviations, and you can't—statistics are horrible things—you say 19 times out of 20. Other challenges, yes, any year that the--. We talked horrendous grading situations. I mentioned the two frost damage years. Those were big challenges.

MC: And the challenge was in essence the ability to respond quickly, was that it? You are dealing with a harvest and decisions had to be made. How would you describe the challenge there?

KT: The biggest challenge was probably discussing with market specialists at the CWB who were very good at selling high-quality grain. And they usually got high-quality grain to sell. The feedback from the market was, "Yes, great stuff." But if you have a year where 40 percent of the total wheat crop is grading Canada Feed, you are going to have a certain number of people who say, "Yes what about the stuff that didn't quite, you know, was almost 3CW Red Spring but it's Canada Feed?" And we're saying, "Yes, Canada Feed is a bottomless--. You can't blend it all together and sell it." So, is there some way of segregating? Okay, the CGC

working with inspection, we developed [No.] 4 CW Red Spring for those years where you needed it for frost damage. So this was stuff that was certainly usable, was not as good as [No.] 3 CW Red Spring. But the challenge was—and if I could go over and talk to this potential buyer in Tunisia or wherever and explain exactly what the data meant and what this higher hardness--. It's got very high water absorption, and what does that mean in terms of--? Whereas the CWB, would want to say protein's good, good varieties. So the challenge is to make sure the marketer doesn't misrepresent lower quality material.

MC: You've mentioned that a lot of times, the issue of your group gathering this excellent data, but then it's being used by other people who might not have the scientific explanations. So your role, there must have been some challenges that you have already alluded to with the CWB and others, the marketers, to understand what this information means, because you're not going to be there. You went to Japan?

KT: Myself and my scientists went to 30-odd different countries over the course of my career. A lot of that was talking about the new harvest. Other times would be with CWB on market development-type missions—places like Indonesia, Philippines and so on, going to China—but that was a different reason because we had this relation to do with the grain grading and putting on some seminars there.

The European countries, of course, the situation changed markedly—and Britain was a prime example, after the Second World War. Probably 80 percent of Canadian exports went to the UK, and a lot of it in the form of flour, all out of Thunder Bay of course. But then the Brits increased their own milling capacity, so they had less requirement for flour, and they also reduced their dependence on North American wheat, growing more English wheat. I mentioned the Chorleywood bread process. Over the course of time, Britain went from the most important buyer to not the most important buyer. And unfortunately for Thunder Bay over the years, as I'm sure you're aware, the markets have really shifted. Most of the markets now tend to be out of Vancouver. I don't know what the proportion is, but it probably used to be 70/30 Thunder Bay-West Coast, and it's probably the reverse, or even worse, now.

The challenges, too, are how do you set the grading system so that it's maximizing the advantage to the producer? You can't just target all your quality standards to Japan, this very high level. You have to protect and recognize that [No.] 3 CW Red Spring is good stuff, except it's going to vary from year. Because in a frost damage year it's going to have the characteristics of frost, not that serious, but there. And in a wet harvest year, it's going to have higher alpha-amylase activity, more bleach. Increasingly though, it's very important to make sure that none of the grades that are going to be used for food or feed contain unacceptable levels of toxic residues. I mentioned the mycology, the effect of field and storage moulds and understanding that you don't want stuff like [inaudible] toxin, any at all. But we still have to monitor after the fact.

It was quite interesting when the organic farmers, when the organic industry got this good niche market in Europe for example. There were pros and cons for the buyer. But first of all, we were never in a position to do any work for the organic industry because our job—one of the major parts—was to make sure that the non-organic grain, the regular grain, was completely acceptable, no unacceptable levels. Just testing the samples of organic grain, doesn't tell you anything. The fact that it might be free from whatever, well our regular grain is also free. But the organic people have the niche, and there's the buyer that wants to have--. Now that buyer has negative things to deal with because he's usually getting it from an organic grower in a fairly small area, and the uniformity is going to be all over the place, and the protein content is going to be all over the place. But he's going to deal with that and what he's using it for. That would be up to him. But it was difficult for us. We obviously couldn't bad-mouth the organic industry. We didn't have any--. Our job was to make sure that the regular stuff was completely okay. We couldn't say organic was better. Better than what?

MC: So several challenges there.

KT: Always, as long as you don't lose your sense of humour. My motto's always been: Take what you do seriously, but don't take yourself seriously.

MC: What do you think were the major changes? You mentioned quite a few of them.

KT: The very obvious one has been the--. Like when I first joined the Lab, I don't know how many primary elevators there were, certainly well over 5,000 country elevators. Now there's--, I don't know how many hundreds there are, but it certainly isn't thousands. Then, obviously the changes of United States becoming a market, that poses challenges because now you are exporting rail cars and not shipments on the boats, so the variability is going to be higher from car to car. The changes certainly--. The awareness of the buyer to, as I mentioned, nasty things, toxic residues and so on. The extent to which the market has become much more diverse. We got into noodles, testing and technology as one aspect. We worked with the breeders on developing white wheats with the specific end-use directed towards noodles and things other than high volume bread. So that has been a change. I'm trying to think globally now.

Obviously, a lot of changes within the lab, because as new technology and new instrumentation becomes available, we've taken advantage of it. The extent to which we have developed rapid instrumental tests for grain has been revolutionary. The extent to which computers have come in. That obviously has revolutionized, to an extent, the carrying out of research. I remember in my first post-doc year sitting with one of these Marchant calculators and doing regression analysis individually, going through the formula. Oh geez, now scientists have got it made with this software, he plugs in his data, and he has all the statistical analysis you could want and more, probably. A lot of stuff gets published that should never get published, but that's another story.

MC: What would you say you are most proud of, your greatest joy, what you're most satisfied with?

KT: I feel that I have, certainly during my time as director, done a good job in putting the total package together in a perhaps more logical way—the extent to which we have meshed together the responsibilities of the individual scientists both for the base of expertise and the responsibility for the surveys.

MC: Did that involve a change?

KT: Yes, I did some structural changes as well. But I suppose that as a research scientist we did some fairly ground-breaking research on baking technology to the extent that it's quite funny really because my expertise, anybody's expertise, has got to be strictly defined, not overstated. I remember once going to Australia, my second trip about 1974. I was invited over. I was their overseas guest speaker at the cereal chemists' conference. So I did my thing there. I've got a lot of good friends in Australia. And then I went to Brisbane, and the local person there who I didn't know until I arrived. They thought that God was arriving. She worked for a flour milling company and takes me to visit this bakery, one of her customers, and essentially, she says, "Here's this world expert in bread making who's going to solve all your problems." And I said, "No." That was quite funny.

We had a good discussion with that baker. This was in Brisbane. He took me home for lunch. He had this nice house, flowers everywhere. And then we had this open porch area where we sat. I looked and there was this row of plastic flowers. I couldn't believe it. Oh, I don't know. I think I'm happy that I enjoyed my work, albeit there were some challenges and stresses on the managerial side obviously. But I feel satisfied with the contribution I made. I'm not saying it's going to change the world, because it's not.

MC: What are the key contributions you yourself made or in a broader sense the Lab, to the international grain industry?

KT: That's a good question. I think the Lab and the support, the scientific, technical support. The main contribution, as I said before, is the credibility that we instilled in the buyer, the potential buyer, and the recognition is huge, particularly so because as I said before, we are separate from the marketers and we can--.

MC: You can't buy that sort of credibility.

KT: You can't buy it, no, that kind of good will. But it worked very well, worked very well. You go around some of these flourmills around the world and they'd be showing you, "Oh, look at all this junk we got out of American wheat." In a sense it wasn't fair.

I've got some very good friends that used to travel to the US. I used to bump into them. They would be going through the mill. The Japanese were great ones. You had to know the game because the Americans, the Australians, and ourselves would all go over and discuss with the Japanese, so that meant with the Food Agency, with the individual mills, and so on. Each of the three of us would essentially be told, "You guys had better smarten up otherwise we're going--."

MC: To the other guys.

KT: And you know darn well there is no way they were going to change the proportion. They are always going to buy so much Canadian, so much American, so much, but they tried to play one against the other.

MC: That must have been fun.

KT: But it was easier for us probably than for the others who did have some problems. But do they appreciate--. There was one year the Japanese had a problem, and Henry Fast and myself flew over within a week. We didn't necessarily solve the problem, but we made a lot of points because we had gone over. We discussed.

MC: Are there other things you would like to tell us about that we haven't discussed? Is there anything we missed, do you think?

KT: Oh, I'm sure with my memory the way it is. So as long as I don't have to talk about my golf score. No, it's been interesting, and it was an interesting career. The frustration I suppose was always seeing what the producer was having to go through—not only the vagaries of weather from year to year, but the vagaries of the market that was up and down. You could see the rest of the grain industry making money and the poor old producer was taking hits. We had some, I used to belong to the [inaudible] harvest.

Because I was the director, I was also the chief chemist under the Canada Grain Act. So I was part of the Committee on Western Grain Standards, and those were interesting meetings because we had individual, maybe 20 members, and they would be, three-quarters would be producers, some would be processors, and so on—some very interesting people, a good opportunity to have some interaction with producers. I've always had a lot of respect for producers. They got to have expertise in so many different things, not least is the business acumen and all the way, the same sort of thing as the breeders and the disease people they've got to know. And then they are at the mercy of--. They can do everything right and still get wiped out. Philosophically, I don't think I could be a producer.

MC: Philosophically or practically?

KT: Practically, just the idea that I would get wiped out. In the same way, I suppose I would not be a good person to go into business for myself because I would probably get wiped out. It was an interesting career, if you like. It started full circle. Even some of my baking, original baking training when I was 16 or 17 years old, involved cake decoration, so I decorated wedding cakes for my kids. I've still got, before you go, I'll show you a couple of things. I've got to throw them out.

MC: Well actually talking about, you're talking about your cake decorating kit, one of the things that we ask people too is if you have any memorabilia that might be something unique that we could potentially make a copy of, if it's pictures or any special documents of that sort?

KT: I don't think I have. You certainly wouldn't be interested in the wedding cakes that I've produced. I wish I had a copy of the paper that Chauncy Alcock wrote.

MC: The one on the Panama Canal? I wonder where that would be?

KT: I can remember once giving a lecture, I forget where it was, and a slip of the tongue and instead of saying Panama Canal, I said the Suez Canal. I could see these puzzled looks, leaving Vancouver going through the Suez Canal?

MC: That would be a very important historic document.

KT: It should be somewhere. The GRL library should have it.

MC: How would you spell that person's name just to have it on tape?

KT: I think it's A-L-C-O-C-K.

MC: And the first name was?

KT: I'm not sure what his first name was, Chauncy.

MC: And he was a person with the Lab? No, not the Lab.

KT: He started off at the GRL, and then he worked for, I'm not sure if it was Sioux Line Mills in the lab there, and then he went to the CWB. And when I--. This was in the late '60s. I got to know him quite well. He was a delightful guy, very kind, very interested in you. He helped to set up the market development section in the CWB.

MC: And that document would have been produced while he was working with--?

KT: It was written up. I don't know what date it was. In fact, I'm not even sure. It would have been during the First World War, 1916-1917-ish, and the paper would have been published around that time, maybe 1919, give or take.

MC: It was it published in a journal?

KT: Oh, yes. It was written up, yes.

MC: Then it must exist.

KT: I read it once. It was quite amusing reading, in the sense that it was very flowery. He could have put it in about two pages, whatever. But that was the style of the time.

MC: So maybe you don't have any memorabilia.

KT: No, I'm not a collector. I'm not very tidy. I tidy up once in a while. I used to drive my secretaries crazy. Now I just drive my wife crazy.

MC: That's happens when the men retire. Well, it sounds like we pretty well covered [inaudible] your golf game and such. We will close then with a big thank you. If you do think of anything more that you are burning to tell us, just let us know and get in contact with us.

KT: Okay.

MC: We'll turn the machine off now and go and look at your cake decorating. Thank you very much.

End of interview.