Promoting and Maintaining the Department of Surveying Engineering

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Notes prepared for presentation 29 October 2010 as part of the GGE 50th Anniversary Program at Geomatics Atlantic in the Delta Hotel, Fredericton.

[*In my opening remarks I praised Wendy's book and suggested everyone get a copy*]

As you just heard, the title I was given was *Promoting and Maintaining the Department of Surveying Engineering* but I would be remiss if I didn't remind you that without Gottfried we would not be here today. There would be no 50th anniversary of the Geodesy and Geomatics Engineering Department because there would not be such a department at UNB, and it's not a stretch to say that the geomatics presence at North American universities would not be nearly as vigorous as it is.

Over a long life I have known many outstanding men and women but the most outstanding of them all is Gottfried. I've known a few workaholics, one of them being my Dad, but I've never known anyone else who could be consistently productive eighteen hours day, day after day, week after week. Whether it's solitary work at his desk or working with people, Gottfried does not waste time. I don't know how he prepares conference presentations now but I do know how he did them for a great many years. He checked in to the conference hotel several hours before his presentation was scheduled, secluded himself in his room, and drafted his presentation in longhand. As you know his presentations are always clear and well organized. Most of us draft, then revise, and revise yet again.

To use a bit of youth jargon, Gottfried is "cool." He admits that sometimes he gets annoyed but he never lets it show. Before sending anything out in writing or speaking about a contentious issue he thinks it through and works out a cool, rational approach. He never sounds off for the sake of sounding off.

He can think fast. On the day of the Encaenia dinner preceding the awarding of his honorary doctorate, the President had asked me to let Gottfried know that he'd be calling on Gottfried to reply to the toast to the honorary degree recipients. I didn't see Gottfried until we were at the dinner table and even then the meal was well along before I remembered to relay the President's message. Had I been given such short notice I'd have panicked but Gottfried continued with his dinner and at the appropriate time gave a very timely message on behalf of his fellow recipients.

Because of its geographic challenge, Canada has long been a leader in applying innovative solutions to its surveying and mapping problems, but, academically, until the 1960s, it was anything but a leader. In 1957 I attended the meetings of the IUGG – the International Union of Geodesy and Geophysics in Toronto. Under the leadership of J. Tuzo Wilson, Canadian academics held their own with the world's best in geophysics but I was embarrassed to find that in geodesy, not only were there no Canadian academics presenting papers or participating in the

Study Groups there wasn't a single one in attendance! In geodesy the only Canadian presence was my boss, J.E.R. Ross, the Dominion Geodesist. He reported on our shoran network and he was a key member of a couple of study groups. Thanks to Gottfried that is all changed. By creating a research-oriented department that included geodesy, Canadian academic geodesists are now among the best in the world. The textbook, *Geodesy: The Concepts* by Vanicek and Krakiwsky, has been reprinted several times and has been translated into several languages,

The older members of this audience will know that I'd had 20 years with what is now Natural Resources Canada in Ottawa before coming to UNB. There, I'd been on the Shoran Survey that provided second order geodetic control to all of northern Canada, I'd measured gravity in Canada and internationally for nine years, and I'd been a staff officer in the Surveys and Mapping Branch, and in 1970-71 I was Acting Director of the Geodetic Survey of Canada. I had been active in the CIS—the Canadian Institute of Surveying—now the CIG, and was president for the 1968-9 year. In my CIS role and my Surveys and Mapping staff officer role I had collaborated with Gottfried in organizing several conferences at UNB and in publishing the proceedings. We had many meetings, as committee members, and one-on-one. Not one of these meetings was a waste of time. At every meeting with Gottfried there was progress. As I noted above, he didn't waste his time nor anybody else's.

There was an off-the-record meeting in the late 1960s at a time when the Department had few students. I didn't attend but I heard about it indirectly. Apparently this meeting had been called to see whether the Department was viable or if it should be closed. Gottfried, rather than just appealing for more time, took the bold approach and said the Department needed more faculty and more support staff. And he got it: three more faculty positions and some support staff. It was the capstone. It enabled the Department to be a true leader. That's why we're here today!

It was a complete surprise to me when, in the fall of 1970, Gottfried told me that he was leaving UNB and that he'd like to see me take his place as chairman. I thought he was putting me on. I didn't have a PhD, I had no teaching experience, and I wasn't an outstanding researcher. He explained that he had recruited excellent researchers and good teachers and that what the Department needed was a chairman who knew the national surveying community and who could keep the team of keen young Turks working together. He pointed out the obvious, namely, that he wasn't offering me the position; that there would be an open competition.

In due time, there was a competition, I did put in an application and, to my surprise, I was selected.

With eight keen young PhDs I realized that the Department would be better off if I helped each of them to realize their full research potential than if I tried to do significant research myself. Although I didn't say so explicitly I tried to make it clear that I was working for the faculty rather than they working for me. Department meetings weren't called unless necessary; on the other hand no decisions affecting faculty members were made without them being consulted. I wanted everyone to feel secure. I knew that I had a veto but I strived for consensus on all major issues.

The concern of everyone was student numbers and, indirectly, the acceptance of the graduates by employers. The best student recruitment incentive is a good job market. Practicing land surveyors liked the old system of articled students who worked hard for low pay for a long time. Paying a reasonable salary to a graduate who still needed experience was a hard sell. Gradually, the partners in the larger, more progressive firms saw the potential of the new technology and were willing to invest in a graduate. Even the directors of Government surveys needed to be confident in themselves to hire one of these young people who had a better education than they did.

In the 1970s few Canadians had ever been to Fredericton and many of those who had were not aware of UNB. This was especially true of Westerners. Gottfried had recognized this and hosted several meetings that brought members of the surveying community to Fredericton. We continued hosting meetings. In 1974 we had an *International Symposium on Problems Related to the Redefinition of North American Geodetic Networks*. In 1975 we hosted the annual meeting of CIS, then a meeting that drew 300 to 400 people from all across the county. The theme was *The Surveyor as an Information Manager.* In 1977 we hosted the *IXth National Surveying Teachers' Conference*. This was the first time the group had met outside the United States.

We started a modified version of a Co-operative Education program.

And we were lucky. For some reason, enrolment in surveying, which tends to have a 100-year cycle, hit a 100-year peak in the early 1980s. At Laval, in Britain, in Australia, New Zealand, even in the U.S., enrolments in surveying were going through the roof. For several years we had more than 175 undergraduates and more than 60 graduate students. In the classrooms, students were sitting on the windowsills.

My vision for the Department was the same as it had been for the profession when I was active in CIS and in the S & M Branch. It was symbolized in the "bubble chart" that I'd prepared for the Colloquium in 1959 [and is in *By Any Measure*]. It was inclusive. It included geodesy, photogrammetry, cartography, hydrography, engineering and mining surveying, and, of course, land surveying. We didn't want to emulate the Ohio State program and be known just for one subdiscipline.

In this I had an advantage. I had no formal education in surveying. My degrees were in engineering physics; in my bachelor's degree my specialization had been in X-rays and spectroscopy. With a good foundation in mathematics and a more depth in optics than any survey course I wasn't handicapped. I did have 20 years relevant experience but I had no emotional attachment to geodesy or to photogrammetry, or cartography, or hydrography. I respected them all and I was interested in them all.

It was obvious that the surveying and mapping world was changing:

- e.d.m. was replacing the transit and chain.

- digital computers were replacing logarithms and desk calculators
- satellite positioning, though not yet GPS, was replacing astronomic positioning
- remote sensing was replacing air photography
- scanners and plotters were replacing draftsmen

We realized that our role was to lead the profession, not to follow it. Our curriculum had to be ten years ahead of the profession: our students were in school for five years and, on average, they needed about five years experience before they moved into positions where they could make significant changes. We wanted them to be ready when the opportunity to innovate came.

Our program was a classic example of the academic model in which research feeds and complements teaching. A professor gets a grant for research in a new field. He gets one or more graduate students. He learns along with his students. He develops a course for graduate students, then he opens it up as an elective for undergraduates, then it becomes a core undergraduate course. Some examples: Adam Chrzanowski did this in engineering surveys; Ed Krakiwsky did it in satellite positioning; Petr Vanicek and Ed did this in what we used to call adjustments and is now called Least Squares Estimation. Salem Masry did it in digital mapping, the forerunner of GIS; Wolfgang Faig did it in mapping; Eugene Derenyi did it in remote sensing, Dave Wells did it in hydrography; and John McLaughlin did it in land studies. This meant adding courses.

What to do? We already had a 240 credit hour curriculum. First we set out to reduce this to 210 without lowering the standards for the upper level courses. That was painful but we did it. Then, just as we were congratulating ourselves for this accomplishment, the Faculty of Engineering said we had to reduce it to 180 credit hours and four years. That was much more painful. Professors don't like to abandon courses that they've refined over the years. Yet we needed consensus.

To help with this transition, we established an Advisory Committee made up of the most progressive leaders in the profession. We briefed them on our objectives and what we were doing and asked for their advice. They saw the merit of getting away from the skill-training courses and in emphasizing fundamentals. This was a great help in making this transition.

Of the faculty members when I joined in 1971 Gerhard Gloss had been with the Department the longest. Gottfried had brought in Adam Chrzanowski and supported him in developing a research and teaching program in engineering and mining surveying. He had brought in Ed Krakiwsky and supported him in research and teaching on positioning using Doppler satellites. Eugene Derenyi started as a graduate student, then he'd been appointed to faculty and encouraged to develop a remote sensing program. Gottfried, a photogrammetrist, had already acquired one of the first analytical stereoplotters and recruited Dr. Salem El Masry to work on it. Petr Vanicek and Wolfgang Faig had been Gottfried's last appointments. They started along with me in the fall of 1971.

In land surveying, with Gottfried's coaching, Willis Roberts was leading a drive to modernize a system that, in the Atlantic Provinces, had changed very little since it was established in the late

1700s. He campaigned for geodetic coordinates to replace "metes and bounds" and for a land titles system to replace the archaic land registry. Willis had been teaching a course in land surveying but had turned it over to bright young graduate named John McLaughlin who was teaching on a part-time contract. The first appointment that I made was to make John full time. I knew John had potential and I'd like to be able to say that I knew then that he would go on to become president, but in all honesty I can't make such a claim. Sorry John! Don Thomson had done his bachelor's, master's, and doctorate at UNB and was on faculty for a few years before answering the siren call to The West. In the late 1970s Ed Krakiwsky couldn't resist the opportunity to go back to his home town, and start a Surveying Engineering Department at the University of Calgary. We recruited Dave Wells, who had earned his doctorate at UNB, to develop a hydrographic program and we recruited Richard Langley who had a PhD in VLBI—Very Long Baseline Interferometry, the use of quasars to measure long distances—to specialize in satellite applications. I'm proud of all the appointments that were made on my watch.

You've all heard the old aphorism: Imitation is the best form of flattery. In my first year at UNB Gordon Gracie, who had been recruited by the Geography Department on the Erindale campus of the University of Toronto, to establish a survey science program, asked if he could come and observe our program in action. A few years later, the Dean of Engineering and the first two faculty members of the Department of Surveying at The University of Maine in Orono asked if they could come over and see what we were doing and how we were doing it. When Ed Krakiwsky was setting up the Department in Calgary he didn't have to come and observe, and he paid us a complement by using many of our lecture notes.

In the late 1970s when we had twice as many undergraduate students and almost as many graduate students as the number of practicing New Brunswick Land Surveyors, I knew from experience in the Ottawa bureaucracy that it was only a matter of time till some nit-picking bureaucrat would try to embarrass us. With this in mind, I had no hesitation in backing Salem Masry in his effort to start what has become a thriving company. Universal Systems, now known by the name of its product, CARIS, is perhaps the oldest and most firmly established IT business in a sector that now employs more people in the Fredericton area than both government and the two universities, These are not minimum wage jobs. And CARIS is neither depleting a natural resource nor contributing to pollution. It's not even dependent on the cost of energy. It's the best type of growth possible for the Province. Without the Department of Surveying Engineering I can say without any hesitation that neither Salem Masry nor CARIS would be in Fredericton.

You have all heard the loosely-defined term "world class." In academia it is used to describe a professor who is recognized by his peers internationally as a leader. World-class profs are invited to give keynote talks at conferences, to chair national and international study groups, and the textbooks that they write become best-sellers. Needless to say, they get tempting job offers. A Department, especially one in a small university like UNB, considers itself fortunate to have one professor who can be described as world class. In the early 1980s, in my view, five of our ten faculty were "world class." I won't embarrass them by naming them. You can make your own list!

To conclude on a personal note: the tentative title of my memoirs is "It's All Been Fun." All my working life I was paid for enjoying myself. As a junior clerk in a bank in a small town it was fascinating to be privy to the financial affairs of the leading entrepreneurs. As a radar tech during World War II, I had the opportunity to see parts of the world such as South East Asia, that were a mystery to almost all Canadians at that time. It was exciting having a small role in radar, then a new leading edge field without which the Battle of Britain would have been lost.

My nine years on the Shoran survey enabled me to see virtually all of Canada including the high Arctic. In my nine years on gravity surveys I saw some parts of Northern Canada up close. As a member of an international team working on a world gravity network I had the opportunity to go from Point Barrow on the coast of the Beaufort Sea to Tierra del Fuego and back over the same route. It was exciting to be part of the geoscience community when the concept of plate tectonics and the role of meteor impacts on the earth were evolving. At the meetings of the *International Gravity Bureau* I represented Canada when the Commission was working on a world-wide gravity network. As a staff officer in a federal department I "shoveled smoke," that is I drafted countless memos to answer the senior bureaucrats' question "Why?" Why were we doing this? Why we were we doing that? It a challenge in creative writing to say the same thing in different words time after time.

Coming back to the present it's gratifying to see that it continues to thrive and it's especially good to see that it has not only retained the ranking of "one" in research on campus but it has been singled out as an "Outstanding One." Congratulations to Peter, to Richard, to John [Hughes-Clark], to Hun, to Marcelo, to Sue, and of course to those dynamic old guys: Petr Vanicek, and Adam Chrzanowski who can't stop being productive.

My fourteen years as Chair of the Department of Surveying Engineering was a great capstone to my career. It was fun being chair of a Department that truly did "make a significant difference!" Thank you, UNB. And thank you all!

Recollections of a couple of tense times:
one with undergraduates, and one with graduate students

[I didn't use this but, having drafted it, I'm sending it along.]

The Department had followed Gottfried's lead and been colour blind. Although we had many students from Africa and Asia I never received even one complaint from a student about faculty being racist. Regrettably I can't say this about all the students.

The undergraduate story

In the early 1970s we still had the lock-step year. A class was together for all their courses, and, except for labs, they were in the same room. There was one class, half white, half black. Two of the black students were women, and one of them was pregnant and occasionally morning sick and had to use the sink at the back of the room. From time to time some of the younger white boys couldn't resist expressing their annoyance and, needless to say, this brought some of the black boys to her defense. Fortunately there were two level-headed mature students in the class, one Canadian, one Latin American. They did their best to keep peace but it got to the stage where they felt I should get involved.

I knew that my direct intervention was highly likely to be counter-productive. On the other hand doing nothing left open the possibility that the next time I heard about it might be on the national news. We wanted publicity but not that kind! I consulted the Dean, Leslie Jaeger, a wily politically astute man who once was considered a candidate for leader of a British political party. He suggested I discuss it with the head of the Counseling Service. I did and Norm Whitney was assigned to it. Norm is a biologist as well as being an ordained clergyman and a skilled counselor. By the way, almost my age, he is still working on campus. Norm suggested a "healing circle." A half day was set aside for all the students in the class, Norm, another counselor, the Dean, and I met in the big room in the Alumni Memorial Building. We formed a circle and Norm very skillfully drew out the story, and led the group to a conciliatory position. It worked. The tension subsided.

I've always been grateful to Norm for saving the Department from serious embarrassment.

The graduate student story.

Just before the Iranian Revolution of 1979 we had ten graduate students from Iran, funded generously by the Shah's Government. They were being prepared to lead in the transformation of a military technologist program to a civilian degree-granting institution. There was one Ba'hai, one Zorastrian, and eight Islamists of varying levels of fervour. A few were ardent supporters of the Ayatollah. They announced that they were going to stage a protest march. Feelings were running high, and again, it didn't take much imagination to visualize an item on the national news.

What to do? Again, asking them not to do it was likely to be counter-productive. I decided to wait it out. The march was scheduled for 5:00 o'clock from the top of Dineen Drive down to the Engineering Building. I found a window in Head Hall where I could watch discreetly. Fortunately, their publicity wasn't good. Very few were on the street and those who were disregarded it. I heaved a great sigh of relief!