

In Celebration of the Muse

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A museum is a place for contemplation. One of the wonderful things about a museum is that the same display will trigger different responses in the minds of various observers. Whether it is the Metropolitan Museum of Art in New York City; the Surveying Museum in Lansing, Michigan; the Chisholm Trail Museum in Kingfisher, Oklahoma; or the Farm and Ranch Heritage Museum in Las Cruces, New Mexico; they all inspire appreciation in the mind of the beholder for the contributions that others have made to civilization and our quality of life. There are many others. Suggesting that a museum need not have walls, windows, or doors, I'd like to share some muses on a recent trip through the "backyard" of North America.

I was granted a sabbatical leave during the 2005-2006 academic year for the purpose of completing a book I am writing on "The 3-D Global Spatial Data Model." As part of my sabbatical, I made a 2-week trip to visit the Geomatics Engineering program at the University of Calgary in Alberta, Canada. It is about 1900 miles one way and, for various reasons, I drove – alone. In those two weeks I spent 60+ hours behind the wheel and had lots of time to muse. I encountered countless courteous drivers along the way and only one s.o.b. who suffered a moment of inattention and nearly ran me off the road. Let's just say it was payback for the times I've been inattentative.

The Geomatics Engineering program at the University of Calgary was started in 1979 and has been enormously successful since then. According to their most recent Annual Report, they have 156 undergraduate and 109 graduate students. Freshman College of Engineering enrollment is capped at 650 students and all freshman engineering students take common core courses. Only after successful completion of the first year do they get to enter a major. Geomatics enrollment is competitive and capped at 50 students per year. While the NMSU Surveying Engineering program (undergrad only) has 3 full time faculty, the Calgary program has 19 faculty (both undergraduate and graduate) in the following research areas: digital imaging systems; engineering metrology; GIS and land studies; gravity field and geodynamics; and position, location, & navigation.

I left Las Cruces September 10, 2005, at 7:30 a.m. and, even at that hour; I used the air conditioner to stay cool. But, by the time I got to Boulder, Colorado, (where I stayed overnight with our son) air conditioning was not required. How did those early explorers and settlers cope with vagaries of the weather and, without good roads, how did they cross all those hills, ridges, valleys, gullies, streams, and, in several cases, formidable rivers? Me? Zipping along at 75 mph, I hardly noticed them. What a tragedy. But I traveled over 700 miles the first day.

The second day was even better as I made it to Bozeman, Montana. Not only was the a/c not required, a long sleeve shirt felt good in the crisp autumn evening air as I ambled through a light rain into a well lighted Subway sandwich shop – just seconds before a group of high school students (cowboys and cowgirls) who, it seemed, took forever to get their orders filled. But, guess what, no one appeared to be in a hurry and they were obviously enjoying themselves. You see, I had been in Bozeman once before and was not so favorably impressed. It was on a family trip in June, 1987, and we were looking for a good rest after traveling all day on Interstate 90 from Spokane, Washington. We rolled into Bozeman about 5 p.m. and discovered it was right in the middle of Rodeo Days – not a vacant motel room in town. We finally found a small motel room in Livingston about 30 miles east of Bozeman. It was OK, but the kids were disappointed that there was no swimming pool. So it goes

The third day I crossed the Continental Divide – twice. The interstate highway gets pretty high near Butte, Montana and the pine trees at that elevation are quite majestic. But, they get more rain at those higher elevations and the corresponding climate is markedly different than the sand, sage brush, grass, and mesquite seen in the deserts of New Mexico. Then it was a long drive from Great Falls, Montana, across the rolling plains to the Canadian border. I thought the U.S. – Canadian border was well marked. I guess it is, but I could see no evidence of a border from the main highway. It looks like the farmers along the border can meander across the fields with no obstacles in sight. I mean, nothing is nothing – right? There is a chain link fence for a hundred yards or so along the highway leading up to the border station. The fences channel all traffic to a solitary group of buildings on the prairie beside the gates marked with red X's and green arrows. That's right, just follow the green arrows, stop, wait, and answer the questions.

Oh my, in Canada I am a foreigner. Thankfully they speak the same language but the speed limit is posted in kilometers per hour and gas is sold in liters. And there is this thing called currency exchange. There is one exchange rate for buying Canadian dollars and a different rate for buying U.S. dollars. It seems both are stacked against the buyer. Yeah, being a banker is like being a stock broker – make money regardless of whether the client is buying or selling. But, the people are friendly and Calgary seems a bit like Denver – lots of traffic, mountains in the distance, changeable weather, and quite scenic – including the orange construction traffic cones.

The University of Calgary offered many new experiences. The engineering complex is quite impressive and there is an imposing Olympic Ice Arena right next to the Kinesiology Complex. Maybe you already know what Kinesiology is. I had to look it up. The discipline of Kinesiology involves the study of human movement. It seems that the Canadians take their sports seriously and that they associate kinesiology with any sport activity. The Kinesiology Complex is nice (classy) and appeared to be one of the largest complexes on campus. Interesting. I also went into the Nickle Art Museum to muse. I was not disappointed and left an hour later with a new appreciation for patterns of light, shadows, tree trunks, and sun filtering through snow laden branches. No, I did not take time to see everything or to request a meaningful interpretation of what I saw.

Back to surveying. Years ago when I was Editor of the ASCE Journal of Surveying Engineering, I needed reviewers who were experts on the technical material in the

various papers submitted for review and possible publication. Among others, the Geomatics Engineering faculty from the University of Calgary was very helpful and always provided high-quality reviews. It was therefore gratifying to visit their campus and meet the faculty of one of the world's premier geomatics engineering programs. In addition to renewing acquaintances, I wanted to lay my cards on the table, so to speak, to make sure the focus of the 3-D book I'm writing remains legitimate. I was gratified to learn that my focus is still relevant and I received lots of positive encouragement on writing the book.

I left Calgary on September 23, 2005, and got back to Las Cruces on Sunday evening September 25, 2005. I am very grateful for the hospitality the Canadians extended to me but it sure felt good to be back in the USA. It was a long drive and I averaged 33.9 mpg for the 3,820 miles up and back. It was during those driving hours, especially on my way back, that I took the opportunity to do some serious musing about what I had learned. With regard to the bigger picture of surveying and surveying education, the following is only a small part of what could be a much larger discussion.

1. Surveying is a wonderful profession. Whether we find ourselves working on the technical end of the spectrum, on the professional end, or anywhere between, surveying provides excellent opportunities for upward mobility and worthwhile activities for persons with a variety of talents and interests. Some people really enjoy working outside but, I guess the fascination for me is geometry. Surveying also provides a sense of "connectiveness" as we read the writings and follow the footsteps of our predecessors; as we follow, create, and lay out new lines like those of the U.S. Public Land Survey System; and as we make maps from our many measurements. We also get paid to work with computers, GPS units, and other high-tech gadgets. Life is good.
2. Surveying education in the U.S. has come a long way but we are still facing some serious challenges. I've long tried to take the approach that surveying practice and education are both just as equal as engineering. Maybe I'm wrong, but I'll keep trying. In the paper I presented at the XXth North American Surveying Educators Conference in June 2005 in Corpus Christi, Texas, I tried to emphasize the following two points:
 - a. It is not fair to compare technical activities in one discipline with professional activities in another. Can that be the reason for some of those disparaging remarks we hear between surveying and engineering?
 - b. None of us is perfect - we all have room to grow. But, I believe it is futile to build a reputation (personal, professional, or institutional) on the foibles of others. We need to explore ways to pool our strengths for the good of all.

The Grinter Report (www.asee.org/resources/grinter.cfm) may be a fundamental part of the surveying education challenge. That report identifies the basics of ABET engineering accreditation and stresses the importance of sciences – both fundamental and engineering. The report also anticipates development of other engineering sciences and states that "information theory shows promise of

contributing to measurement and control in all engineering fields.” But the report fails to anticipate the impact of the digital revolution, cross-disciplinary use of spatial data in GISs, or the importance of spatial data accuracy. That report was written in 1955 with a stated quarter-century horizon. Here we are in 2005 – twice the intended horizon. Is it time to revisit the Grinter Report? I believe so.

3. The Canadians have done it differently and their geomatics engineering program is wildly successful. The implication seems to be we should do it their way. Not so fast! To do that is to be guilty of comparing apples and oranges. Geomatics engineering in Canada is very rigorous, their graduates are in great demand, and their graduates are making enormous contributions in the spatial data disciplines all over the world. Although quite successful and serving a demanding market, Calgary is not the only surveying program in Canada. Many of the practicing land surveyors in Canada get their education from one of the technical schools instead of a university. Just as there is a range of rigor in practice, there is a range of rigor in educational endeavors as well. The constituents and administrators of each program need to identify the mission of the program and orchestrate resources in support of that mission.
4. Reflections about successes and challenges for the surveying profession in New Mexico and the Surveying Engineering program at NMSU include:
 - a. Professional leaders in New Mexico are to be commended for supporting the 4-year degree requirement for licensure. But the 4-year degree is not sufficient in and of itself. For example, students who get good grades attend class regularly. Attending class regularly does not mean a student will get a good grade. Many competent surveyors have a 4-year degree. Getting a 4-year degree does not make anyone a competent surveyor.
 - b. With the advent of computers, plotters, total stations, GPS, photogrammetry, and other measurement systems, there is a wider range of technical tools and corresponding rigor that can be applied to most surveying tasks. The successful surveyor will adapt to using new technology but using new technology does not necessarily make one a good or successful surveyor. The educated surveyor who is well grounded in math and science fundamentals understands the importance of inter-disciplinary interaction and who is capable of inspiring others with his or her vision makes an enormous contribution to the profession and to the State of New Mexico.
 - c. Geographic information systems (GISs) are used to organize, store, and manage spatial data. The surveying profession makes extensive use of spatial data and is often looked to when questions arise about the accuracy of spatial data. Some disciplines use GIS as a tool; others consider GIS to be a niche, and still others in more higher applications of information management view GIS as a profession. At the high end of information technology, the computer specialists and systems managers are “running the GIS train” and surveyors are said not to be on it. But, when it comes to actual “on the ground applications” the surveyor is called upon to make sure the pieces all fit and to verify the integrity of spatial

data. Surveyors have the opportunity to interact with other disciplines at various levels and everyone benefits to the extent we find ways to work together at all levels.

- d. The New Mexico Board of Licensure for Professional Engineers and Professional Surveyors (BOLPEPS) is charged with protecting the public against unlicensed and incompetent practice of engineering and surveying services. Given the responsibilities of BOLPEPS, the educational mission of NMSU as a Land Grant University, and the concern of the New Mexico Professional Surveyors (NMPS) for the well-being of its members, it is gratifying to see the respectful interaction between those organizations and to participate in discussion of some of the issues of mutual concern.
5. At NMSU, the Dean of the College of Engineering and the President of New Mexico State University both took office on July 1, 2004. Dean Castillo was an internal candidate and formerly served as Department Head of the NMSU Klipsch School of Electrical and Computer Engineering. President Martin was an external candidate who previously served as Vice President of Agricultural and Natural Resources at the University of Florida. These are but two of the many persons charged with utilizing New Mexico tax resources responsibly in fulfilling the Land Grant Mission of NMSU.

The Surveying Engineering Department at NMSU has only 3 full time faculty and student enrollment has fallen below 40 students. The President and Dean are both under pressure to perform well and they are looking at possible economies realized by merging small departments with larger ones. The Surveying Engineering Department is the target of such a merger. Nationwide in past 30 years, surveying has emerged as a distinct profession separate from civil engineering and having greater professional stature than engineering technology. The NMSU Surveying Engineering Department was established as a separate department in the early 1990's, consistent with the national pattern. The NMSU surveying program obtained ABET accreditation in the Engineering-Related Accreditation Commission (RAC) in the middle 1990's and migrated to offering the Surveying Engineering degree in the late 1990's. In 2001 the NMSU Surveying Engineering degree was accredited by the Engineering Accreditation Commission (EAC) of ABET – on par with other engineering programs in the NMSU College of Engineering.

NMSU also has programs in mechanical, electronics, and civil engineering technology that are accredited by the Technology Accreditation Commission (TAC) of ABET. The NMSU technology programs serve a different niche than do the EAC programs in the College of Engineering but they do it very well. The TAC programs at NMSU are highly regarded.

Now, if you were responsible for running the College of Engineering, what would you do with the Surveying Engineering Department? I believe there are compelling reasons for the Surveying Engineering Department to continue as a separate department but there are two big strikes against us. Enrollment is down and we need significantly more external funding. On the positive side, there are always more job

opportunities than we have graduates available. We serve the exciting and expanding spatial data market and are well regarded by peer programs. We receive significant external support from the Bureau of Land Management. Several vendors have been very generous in loaning us modern equipment for the students to use. The students are an active Student Chapter of the American Congress on Surveying & Mapping/New Mexico Professional Surveyors (ACSM/NMPS) and, in recent years, have brought back three trophies from national student competitions. And, finally, the Surveying Engineering faculty is talented, aggressive, and busy with various projects.

The Civil Engineering Department at NMSU is a very productive research department and the Surveying Engineering faculty would reasonably be held to the same standard if Surveying Engineering were to be merged with Civil. Another factor is that the Civil Engineering Department has long-standing graduate programs while the Surveying Engineering Department has no graduate program. That could make such a move beneficial for the Surveying Engineering program. But, the Surveying Engineering program would need to find a way establish a level playing field so as not to be at the mercy of the civil engineers on administrative and academic issues.

It appears the easy way out would be to merge the NMSU Surveying Engineering Department with the Engineering Technology Department. That is essentially what happened at the University of Maine where the spatial data side of the Spatial Information Science and Engineering Department continued bringing in more research dollars than the surveying side. The undergraduate surveying program got pushed out and now the undergraduate surveying program is in the Engineering Technology Department. Some parts of the surveying profession in New England are happy with that arrangement while others view a merger with engineering technology as an enormous step backward for the surveying profession. The NMSU Surveying Engineering Industrial Advisory Committee has looked at the issue and has provided input to Dean Castillo.

Persons with input on the merger issue are encouraged to contact Dr. Steve Frank, Surveying Engineering Department Head or Dr. Steve Castillo, Dean of the NMSU College of Engineering. There is no known time frame in which a decision will be made by the Dean. Whatever decision is made, the surveying engineering faculty can be expected to continue wholeheartedly supporting the surveying engineering program and the surveying profession in New Mexico.