Marilyn Monroe might have changed everything for U of A engineering student T.W. Fraser Russell (Chemical ’56, MSc Chemical ’58). In the 1950s, Russell was putting himself through school by working summers at the British American refinery (now Imperial Oil) in Edmonton. In the summer between third and fourth year, he was offered a job as a lifeguard at the Banff Springs Hotel.

I went back and forth on that one: design a waste treatment plant or work at a beautiful hotel in the mountains. He ended up choosing the refinery. As it turned out, The River of No Return, a film starring Marilyn Monroe and Robert Mitchum, was filmed in Banff that summer. My replacement was hired to teach Marilyn Monroe to swim. It was the biggest mistake of my life. I still get a lump thinking about it.”

Maybe, but even by phone from his office at the University of Delaware, Russell delivers the story with a hint of a smile in his voice. Although he may have missed out on the delights of Hollywood, he’s done very well as an engineer.

Dr. Russell is the Allan P. Colburn Professor of Chemical Engineering at the University of Delaware. He is a renowned teacher, consultant for the chemical process industry, and chief engineer for a major research program on thin film photovoltaic cells. He has been elected to the National Academy of Engineering and is a Fellow in the American Institute of Chemical Engineers.

But engineering wasn’t always on his radar. As a high school student in Lethbridge, Russell had planned on becoming a pharmacist. “I had a very wise uncle who pointed out that pharmacy was a job where you had to deal with a somewhat demanding public. He didn’t think that I had the patience to do so and suggested I get a part-time job in retail service. I found a Saturday job at the meat counter at Eatons and quickly learned that customer service was indeed not my strong suit. I cast about for what would be closest to pharmacy; I hit upon chemical engineering.

“Russell took the train up to Edmonton in 1952 and settled into a single room in Assiniboia Hall. “Those were a great four years,” he recalls,” both for the academics and the social life.

“It was at the U of A that Russell met his wife Shirley Ann Aldrich, who was studying education. After graduation, Russell took a job with the Alberta Research Council.

“It paid $300 a month, which was a little less than the going rate, but you also got a Master’s degree.”

Working with his supervisors Dr. George Govier (MSc Chemical ’45) and Dr. Gordon Hodgson, Russell studied the flow of oilsands crude oil in pipes. This research produced the first papers published on liquid to liquid flow in pipes.

The work also brought him in contact with Dr. Karl Clark, the oil sands pioneer. Dr. Clark thought that Russell and fellow graduate student Al Sullivan should get to know the oil sands up close. So he took them on a trek to gather a “ton of oil sands” for laboratory research.
“Al and I wondered what we were going to do in the bush with this old guy,” recalls Russell.

After navigating down the Clearwater River to the sampling site, the three men began dynamiting and digging out the oil sand.

“It was a hot day and I conked about noon; Al lasted until 1:00 p.m. Clark, who had stripped down to a pair of paisley boxer shorts, continued on for the rest of the afternoon. After completing all the work, he made us supper and set up camp. He ended up looking after us two young tender feet.

“After earning his MSc degree, Russell went to work as a design engineer for Union Carbide in Montreal. "There were only a few engineers working for Union Carbide Canada at the time, so those of us who were there were assigned projects that engineers would normally only be assigned after they had five or 10 years on the job.”

Russell was put in charge of the economic evaluation, process design, design drafting, construction, and start-up of chemical units to manufacture ethanolamines and glycol ethers.

“I enjoyed the work and appreciated the experience, but I could see that the corporate life was not going to give me the freedom and flexibility that Shirley and I desired. Besides that, I really wanted to teach. A PhD seemed to be the sensible choice.”

In 1961, Russell enrolled in the PhD program at the University of Delaware. The family, now including three young boys (Bruce, Brian, and Carey), moved to Newark, Delaware.

Although Delaware was supposed to be a three-to four-year proposition, it presented an environment that offered the intellectual freedom Russell craved, combined with the opportunity to work on practical problems. In his last year as a graduate student, he was asked to teach the senior-year design course. His success with that course convinced the administration to hire him as a faculty member. He has been with the University of Delaware ever since.

Working at Alberta Research Council in 1957, Russell adjusts the pilot pipeline used to study oil to water flow. Editor's Note: This photo is taken from the book *Athabasca Oil Sands – From Laboratory to Production* by Mary Clark Sheppard, published by Geoscience Publishing.

Russell’s early research efforts focused on multi-phase reactor design problems. This work led to consulting opportunities—first for Union Carbide Canada and later for many companies including the DuPont Company. In 2005, DuPont presented Russell with its Engineering Excellence Award, recognizing his guidance and technical leadership during 30 years of service as a consultant. This was the first time the award had been given to an engineer from outside the company.
In 1979, Russell was asked to take on the directorship of the university’s Institute of Energy Conversion (IEC), which specializes in research on photovoltaic cells, used to convert sunlight to electricity.

“I recognized that a key issue for the photovoltaic industry is figuring out how to manufacture large quantities of photovoltaic modules cheaply. Otherwise, the electricity that comes from these modules is just too expensive. So we worked on laboratory-scale experiments to provide essential information for the commercial-scale manufacture of photovoltaic modules.”

As a result of this focus, the IEC made many significant contributions to thin film photovoltaic technology. In 1992, the laboratory was designated as a University Center of Excellence for Photovoltaic Research and Education, an award previously given to only two institutions in the U.S. Russell continues as the IEC’s chief engineer.

He is also involved in the commercialization of new photovoltaic technology as a member of the board of directors of Colorado-based Ascent Solar Technologies. This development-stage company is working on photovoltaic modules for use in satellites and spacecraft. It is planning an initial public offering sometime this year.

“IT’s exciting to see research move out of the lab,” says Russell. “I’d like to see this technology make a big impact.”

However, Russell considers teaching to be his greatest contribution.

“Of all the things I’ve done, I think teaching is where I’ve had the most positive impact. I truly enjoy interacting with students. My approach is to get each class to a point where they trust me, where they know I’m not going to embarrass them. That’s when you can have an effective dialogue. Students will learn a lot more this way, compared to classes where they just sit and copy material that the instructor presents from a blackboard or from PowerPoint.

“And this takes time. You have to engage students. You must know them by name. You must draw them out. At first, you’ll get two or three of them interested. They’ll get the others interested. It’s greatly satisfying to have a whole class coming in to actively learn.”

While Russell’s teaching has won numerous awards, his most valued feedback is e-mails and letters from former students—and he receives a lot of them. Other treasured comments came from his wife, who was also a teacher. She took one of his engineering courses when she was doing her Master's degree in education.

When Shirley Russell died in 1998, Russell wanted to commemorate her in a way that acknowledged both their contributions to teaching.

He created an endowment for a teaching fellowship at the University of Delaware—the Fraser and Shirley Russell Teaching Fellowship. The award gives a chemical engineering graduate student, usually in the last year of his or her PhD, an opportunity for a supervised teaching experience in the undergraduate program. The student is mentored by an established professor.

"I thought that for the 50th anniversary of my graduation I’d do that same kind of thing at the University of Alberta. The Fraser and Shirley Russell Teaching Fellowship is being set up now, and we will have the first teaching fellow selected by September 2006.

“A good teacher can make a huge difference in their students’ lives. Teaching can turn someone around so quickly—someone who is struggling or someone who doesn’t know what they want to do. I’ve always loved teaching. I understand there is a great deal of pressure on faculty these days to raise money for research—so much so that teaching can take a back seat. It’s a shame. I hope that in
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