

Ralph Sultan

Mining the mind...a most precious resource!

BY PATRICK BRUSKIEWICH

Dr. Ralph Sultan P.Eng. is the MLA for West Vancouver-Capilano. He is a UBC graduate in engineering, a Harvard trained economist, a former Harvard Business School Professor and former Chief Economist of the Royal Bank of Canada.

Patrick: Good Morning Dr. Sultan. I would like to begin by thanking you for agreeing to be interviewed by the Canadian Undergraduate Physics Journal. We are in the process of getting the fall 2009 edition out, the theme of which is "Careers in Physics". I thought I would ask you, to begin, to give a little background about yourself – where you were born, where you went to school. I understand you studied the applied sciences at UBC before going onto Harvard.

Dr. Sultan: I was born and raised in East Vancouver, you might say on the "wrong side" of Main street, went to King Edward High School where incidentally we had some great teachers in the math and science area, and then onto UBC to study engineering. Given my background, I was very concerned about finding an educational path that would lead to very employable skills, and engineering seemed to offer that, and in fact has done so.

Patrick: When did you graduate with your first university degree, your engineering degree?

Dr. Sultan: I graduated from UBC in mechanical engineering in 1956 and went to work for Union Carbide Corporation, a company which no longer exists because of the 1984 Bhopal disaster, leading to the lawyer's suggestion that the way to protect the shareholder's assets was to basically dissolve the company, I think a very unfortunate decision because Union Carbide was a great research engine in chemistry, and applied science, and it is no longer.

Patrick: Recently you wrote a kind letter to *CUPJ* thanking the journal for the article on the U-2 and the AVRO Arrow (*CUPJ* Jan. 2009). In your letter you mentioned that as a young man with Union Carbide you had done some work on the tungsten-carbide plating of the turbine blades in the very powerful Iroquois engine that were being developed for the Arrow and



Dr. Ralph Sultan

on the problem of the high temperature silicone for the wing fillet material.

Dr. Sultan: With hindsight it is a moment that one should cherish. At the time it didn't strike me as being particularly significant. As a technical representative bringing applications from Union Carbide into the field, I was pulled into the Malton facility of A. V. Roe Canada where they were building the Arrow to see what we could do to help them build a wing fillet at the junction between the wing and the fuselage. As the aircraft gained in velocity and was buffeted, the temperature of the fillet would rise to ... oh ... 600 to 700 degree Fahrenheit.

Patrick: What was heating the wing fillet to such high temperatures?

Dr. Sultan: The Arrow was a supersonic design and the skin friction of the air over the wing would heat up the entire vehicle. Unfortunately the properties of silicone elastomers then and I suspect now, could not meet the compressibility standard that they needed ... it might be compressed say 30 % ... at the extremes of the high temperatures and maintain the integrity of the fillet.

Patrick: This sounds a little bit like what happened to the Challenger in 1986 when the fillet material in the seal in the solid fuel booster rocket failed to meet the compressibility requirements and as a result the blow-by of the hot gases during launch caused the loss of seven lives and a space shuttle at launch. A very similar technical challenge.

Dr. Sultan: This could well be. I know the engineer I was dealing with finally threw up his hands and said "Aww ... the hell with it. We will just let the air run right through!"

Patrick: Right through the wing!

Dr. Sultan: Yes. Right through the wing!

Patrick: Goodness! I understand the A.V. Roe engineers were unable to solve this technical problem. I guess this led to the whole problem where to store sufficient fuel if the wings were not sealed ... for want of a seal the plane was lost! What about the tungsten-carbide plating for the high speed turbine blades on the stators and rotors for the Iroquois jet engine?

Dr. Sultan: Union Carbide had developed a method, using an acetylene-fired gun to put, at high velocity, particles of tungsten carbide onto various materials and it turned out this form of plating had advantages when used on turbine blades. The Iroquois engine was hugely forward in scale and power. It was quite a technical achievement. It was to power the Arrow aircraft. As they tested the prototype engines they discovered that plating turbine blades where they rubbed up against each other, which normally would cause fretting and corrosion, could be resolved by this particular plating process.

Patrick: These titanium blades were on that last stages of the Iroquois. This jet engine was the first one ever to have titanium blades. At the time Canadian metallurgists were at the cutting edge of titanium technology.

Dr. Sultan: At the time I really didn't understand the properties of these titanium blades. We took the blades and sent them down to Indianapolis and Union Carbide would blast them with this acetylene gun and I would go down and then talk my way through Customs to get them back into Canada.

Patrick: Were those the blades that were sitting on the desk of the Chief Designer when

the Arrow program was canceled? There were some titanium blades that had yet to be installed in the Iroquois when the Diefenbaker Government announced the termination of the Arrow program. Once these blades were installed and tested the Iroquois would have been ready and they would have then put it to the airframe and it would be an all Canadian aircraft.

Dr. Sultan: This is quite possible. I was in Harvard at the time when Prime Minister Diefenbaker canceled the project. And I felt a twinge. I thought, gosh that was a great project. Why did he do that? And of course we lost most of those technical people to the United States. They went to work on the American space program. And I suppose they accomplished great things. But there was a moment there when Canada lost its nerve and said this is too big for us. We better stop. I think that was unfortunate.

Patrick: When Mr. Prentice the then Federal Minister of Industry was about to announce the Radarsat decision a year back I wrote him a letter the week before reminding him that fifty years ago to the day was when the Prime Minister stood up in the House and canceled the Arrow. In the letter I pointed out that the tragedy was not the cancellation but the fact that there was nothing to come after the Arrow. I suggested that Canada not repeat this with Radarsat. I think Mr. Prentice and his colleagues in Cabinet thought long and hard about that before they announced their decision to block the sale of Radarsat and at my suggestion even went on to expand the uses of Radarsat to other multinational mandates. After working a few years with Union Carbide in the 1950's what did you do next?

Dr. Sultan: From there I went onto Harvard where I took three degrees in the Business School and in the Department of Economics, before going back to the Harvard Business School where I taught for ten years, following that back to Canada for a career in banking and mining. So that in brief is the story of my life.

Patrick: When you returned to Canada, you returned to Central Canada?

Dr. Sultan: I returned to Montreal to become Chief Economist of the Royal Bank of Canada.

Patrick: What year was that?

Dr. Sultan: That was in 1973, and they were looking for someone to stand there and point to the charts and give interest rate forecasts to their customers. I told them that really is not what I do. I am a Micro-economist. I had spent my life to date studying pricing behavior for oligopolistic competitors in the electrical industry.

Patrick: Did you teach on that subject at Harvard?

Dr. Sultan: Yes, I and was viewed as a pricing expert you might say, particularly drawing on my economics background.

Patrick: You must have had opportunities to make presentations to Congress or to other distinguished bodies.

Dr. Sultan: Well, the Harvard Business School where I was a faculty member, had as its clientele the corporate world and so I spent plenty of time with such companies as IBM, General Electric, the Coca Cola company, too as a matter of fact which has it turns out is quite a sophisticated organization.

Patrick: Did you do any presentations to the IMF or bodies like that?

Dr. Sultan: No, that's the point. I was not dealing at the macro level and so when they pulled me up to Montreal and said they would like me to do this I realized this was a macro, total economy, money supply, interest rate, global forces, I said this was not really what I do. They said well ... you have a PhD. from Harvard. I said yes. They said you'll do and you will pick it up quickly. And so I did.

Patrick: Did you hit the books? How did you approach that?

Dr. Sultan: They wisely kept me under wraps for six months until I figured out what was going on. With a PhD. in economics from an institution like Harvard, which was very much imbued in the 50's and early 60's with Keynesian economics, you certainly got a heavy dose of training in macroeconomic theory. Those were the days when Milton Friedman of the University of Chicago had come along and said Mr. Keynes is all wrong, his economic prescriptions are bad policy so that debate was unfolding while I was a graduate student and you were drawn into the macro-world whether you wanted to or not.

Patrick: The year 1973 was a rather interesting time for the North America economy. Was that not the year that President Nixon had to devalue the US dollar and for a brief period Canada's dollar was worth more than the US dollar?

Dr. Sultan: That's right. He basically went off the Gold Standard, which was a landmark in economic and monetary history and Nixon, we think of him of a rascally, vulgar person, but he was actually a thoughtful and wise President, in hindsight in many aspects. The big debate at the Royal Bank into which I was immediately plunged was whether Canada should go to a floating exchange rate.

Patrick: And the decision was?

Dr. Sultan: Up until then Canada had had a fixed exchanged rate. Well, with the stuff that Nixon was doing in Washington it became increasingly difficult for any country, particularly Canada, whose currency was so dependent on what was happening in the United States to peg a value for its currency which would withstand market forces. Many people at Harvard and elsewhere said that countries should not try to peg their exchange rates they should let it float and let the market decide what the dollar is worth. That is we did, after a lot of lobbying and a lot of "speechifying" by Mr. McLaughlin the Chairman of the bank. I wrote the speeches and he stood up and gave them recommending the floating exchange rates and eventually the Bank of Canada came around.

Patrick: How long did it take the Bank of Canada to follow your lead?

Dr. Sultan: Well, I think the Canadian dollar was floated ... the economic historians may correct my memory here ... probably around 1975.

Patrick: So eighteen months to two years after you proposed the floating exchange rate.

Dr. Sultan: Something like that.

Patrick: Do you think this is one of the reasons that Canada has one of the strongest and finest banking systems in the world, that and the fact that there is some oversight on what is done by the banks?

Dr. Sultan: It was a smart move because it freed the Bank of Canada, who of course guides monetary conditions in the country, from spending all its time worrying how to prop up the Canadian dollar if it were weakening. And they turned their attention to more important things like inflation, the interest rates and the conditions of financial markets. And yes, Canada today is admired around the world as having a very solid financial system. We have not gone through the collapse and turmoil in our financial sector that the Americans have unfortunately experienced in the last eighteen months. It is perfectly dreadful and they are still not out of it. So, all of the sudden staid and cautious Canada looks very good.

Patrick: I was actually at Notre Dame in South Bend Indiana doing an experimental run having breakfast when the chairman of the Senate banking committee gave his famous speech saying that "this is a once in a lifetime event and the last time it happened was eighty years ago." And I have to tell you when he said that the entire room went silent. There must have been two hundred people in the room who thought long and hard on what he said. So definitely, you would agree with me that we live in interesting times. I am glad to hear that

interview (continued)

Canada's banking system is strong. Tell us more about the other things you did and how long you were Chief Economist of the Royal Bank of Canada.

Dr. Sultan: Well, I was Chief economist eight of the ten years I was with the bank. I then decided it would be interesting to move onto other things and so I persuaded the bank to send me to Calgary where I headed their oil and gas, and mining group, what we called rather modestly the Global Energy and Minerals Group. I ended up setting up offices in Denver, Dallas, Houston, Toronto, Vancouver, London England, Singapore and possibly New York ... I can't remember. I spent the next two years dashing around the world talking to people about the "World of Energy". In the late seventies was the last big energy crisis.

Patrick: Was that when the Shah of Iran was deposed?

Dr. Sultan: That's right and the whole Middle East became a very unstable place and all of the sudden there were line-ups at the gas pumps in the United States. They ran out of gasoline. It was a very upsetting moment.

Patrick: This was when Carter was President and the hostages were in Teheran and the Soviets invaded Afghanistan.

Dr. Sultan: That's correct.

Patrick: Canada must have helped out by boosting oil production. You have the OPEC oil block and other major producers like Russia, Venezuela and Canada. We must have helped the United States get through that crisis.

Dr. Sultan: We did, however, the Alberta Tar Sands were not yet a factor and I don't think at the time the Americans understood the possibilities of Canada to the degree they do now. All of a sudden Canada looked like a pretty good place and that it had energy self-sufficiency.

Patrick: Was this also around the time the National Energy Policy was being discussed?

Dr. Sultan: Very much so. I was in Calgary when the folks from Ottawa came through to explain it. The government of the day created PetroCanada to have this window on Global Energy Prices.

Patrick: The Trudeau Government bought out PetroFina didn't they?

Dr. Sultan: That's correct. A guy trained in physics became president of the company. He was brought up from Arthur D. Little in Cambridge. He was a Canadian. He flew back and forth to Ottawa on the weekends. He really didn't join the oil patch, of which now I had become a Charter Member you could say. And the new building they put up had a red brick sidewalk and was labeled by the oil company rivals as "Red Square." Bill Hopper was his name.

Patrick: That's quite amusing. So overall, what were your views of that interesting period – the early 1980's?

Dr. Sultan: Well, in hindsight it was an example of a "bubble" and we have gotten to know a lot more about "bubbles", in for instance the real estate market and the stock market. In those days there were not many people from the late-20's that were still active in business and we had sort of forgotten about Bubbles. We had a big bubble in the energy market and we were convinced, all of us, that oil was going to go to \$ 100 per barrel. I convinced the Royal Bank to expand its energy operations aggressively on the basis of our forecasts. That's just the way it looked. For instance there was a proposal to bring oil out of the Arctic with nuclear submarines going under the ice.

Patrick: Was that a Canadian proposal?

Dr. Sultan: It was a Canadian proposal.

Patrick: With submarines powered by "Slow Poke Reactors"?

Dr. Sultan: It was going to be a much more powerful machine than "Slow Poke Reactors". My first introduction to Calgary was to attend a meeting of the Petroleum Club with a speaker Jack Gallagher.

Patrick: Was that Dome Petroleum? ... the House that Jack Built ...

Dr. Sultan: Exactly!

Patrick: I grew up in Edmonton by the way ... during the 60's and 70's

Dr. Sultan: Dome was going to take the oil out of the North under the ice using nuclear powered submarines. And he gave this presentation to a group of three or four hundred hard-bit, practical oil people and everybody cheered. I thought, wow, this is a very far-thinking crowd. That strikes me as being a crazy idea, but they think it is perfectly reasonable. I reached the conclusion that I need to learn more about how they do business here in Calgary. Of course within eighteen or twenty four months Dome had gone bust.

Patrick: They went bust because their liabilities exceeded their assets. Insufficient cash flow? What caused this?

Dr. Sultan: Well they expanded too quickly. As you say they didn't have sufficient cash flow to cover all the obligations they took on. If they had been a little bit more modest ... they were far-seeing people in many ways ... I am sure they would still be around. But they came a cropper and all happened of course with the central collapse of the energy market.

Patrick: That was about 1983 was it?

Dr. Sultan: '82 maybe. Perhaps '83 ... yes. All of these big ideas ... like taking oil out under the ice using nuclear powered submarines ... were gone.

Patrick: That brings us to the middle of the 1980's. When was it that you decided to come back to Vancouver? What brought you back and what has kept you interested here?

Dr. Sultan: Well I was offered a very interesting assignment with the Anglo-American Corporation out of South Africa to come in as the number two man in North America. It is a huge international resource conglomerate headed by a gentleman name Harry Oppenheimer and I was persuaded to leave the Royal Bank and join up with them. They were headquartered in Toronto so that meant a move to Toronto. Like so many things in life, the best laid plans didn't quite work out. I had a disagreement with Anglo as to how they reported their financial results. To make a long story short I was asked to leave. Well here was this whiz kid out on the street, unemployed ... it was quite a shattering experience, but I think good for the soul.

Patrick: I guess there is that adage that if it doesn't kill you it makes you stronger.

Dr. Sultan: That's right. I look back at it as probably a good thing because I think I had through my rather rapid rise at the bank and other successes in the oil patch and so on had become kind of an arrogant, overly confident and probably over reaching management kind of a guy. And it was healthy that I was brought back to earth.

Patrick: Does that lead to more of a people's person, and then to the eventual very people's oriented role you are now playing ... the public office you now hold, as an MLA in the Legislature of the Province of British Columbia?

Dr. Sultan: Perhaps. I did a lot of soul searching. I took a very soft sinecure job with a philanthropic foundation which gave me more time to spend with my family which I had frankly neglected.

Patrick: You were still in Toronto at the time?

Dr. Sultan: I was still in Toronto. I had the time to reflect on what I really wanted to do. Gradually I crept back into the world of entrepreneurship through part ownership of a mining company. I bought a very large Lead-Zinc mine in the Yukon. I did that for several years. Eventually we sold our home in Toronto and decided to semi-retire here in Vancouver.

Patrick: So this is "semi-retirement" for you?

Dr. Sultan: Well, it didn't quite turn out that way. I was still involved with a mining venture up in the west flank of the Rockies above Williston Lake, a very remote part of British Columbia and I also headed up a joint-venture with Bechtel Corporation to build a wood panel factory in

Williams Lake. So I was still a very busy guy. By that time my kids had grown up and moved away, and my wife had sort of grown used to me being out and about and not home as much as she would have preferred.

Patrick: How did you come to get interested in politics?

Dr. Sultan: What caused me to go into politics eventually was the death of my wife ten years ago. It was very devastating. She was a nurse of considerable training and skill. She was very much my life partner. When she passed away it was a devastating psychological blow and I was not in the best frame of mind. Perhaps in that “weakened state” some people approached me about becoming a politician and I thought that could be interesting ... I will give it a try. Before I knew it I was in a tight race to secure this nomination in West-Vancouver Capilano which drew on all my capacities, analytical, my powers of persuasion and most importantly my network of friends and colleagues all the way back to engineering days and before. All the way back to high school as a matter of fact. I was quite impressed. I was quite humbled would be a better way to put it at the degree to which friends I had not really spoken to in any significant way for forty years would say I will help you Ralph. And they did!

Patrick: It sounds like from a very young age your heart has been in the right place and your principles have been strong and clearly reflect Canadian values and for you to tell me that people you had not seen for many years suddenly step forward to help you I think says a lot about your character and personality. I notice your presence in the House in Victoria is a unique presence. You are a back bencher and as you have explained to me in the past that gives you a degree of freedom to express your perspective in a Legislature full of ideas, some good ... some not so good and some ... well ... middling to the point of being ridiculous.

Dr. Sultan: True enough.

Patrick: How do you enjoy and what do you enjoy the most about sitting in the House in Victoria?

Dr. Sultan: Well, first of all, as you have just pointed out just now, the Legislature consists of people drawn from all walks of life. I was cautioned in taking this job by a former MLA saying “Ralph, when you go to Victoria you must appreciate that your colleagues will be a sample. a cross section of British Columbia. All walks of life are represented there.” This is as it should be in a democracy! I have come to recognize the wisdom in that. There aren't many people in the Legislature with three Harvard degrees, I'll say

that much.

Patrick: How do you feel about being a back bencher?

Dr. Sultan: Not having a cabinet position does give me that freedom, as you have described, to pursue things that interest me or areas that I think I can make a special contribution.

Patrick: What are your areas of expertise?

Dr. Sultan: My areas of expertise are perceived to be the financial sector, for example I have been positioned now as an advisor to the Minister of Finance; also the Mining Industry, which is certainly an area where I have had a long employment history, and perhaps through my wife's own professional career and by the pressure and needs of the constituency, the Health Sector. The Health Sector is now about one-half of the Government's activity in Victoria. Its huge, and of course it affects all of us so intimately. If you are going to be a successful politician, you will not go far unless you pay some attention to the Health Sector. And I do.

Patrick: You recently gave a speech to a gathering of Engineers in Montreal about the important role that Professional Engineers play in Canada and the world. You talked about the fact that there are very few members in either the House of Common or in the Legislatures or other levels of Government across Canada who have a science and applied science background. Could you perhaps give us a synopsis of your talk and elaborate on two or three of the important points you have to share about this lack of expertise in Government.

Dr. Sultan: Well, I will certainly try. I began the talk by pointing out, as you just said, of the dearth of engineers in politics, the dearth of scientists in politics. I think that many highly educated people view politics as a bit of a shabby profession that would not really suit them, and maybe from their point of view they are right. It certainly is not the Ivy Halls of Learning as one might associate with, say, Harvard University. If you do a numerical head count of the number of scientists and engineers in politics in Canada, in the United States and the same would be true, I think in the United Kingdom, there are very, very few scientists and engineers at all. I am the only professional engineer here in the Legislative Assembly of British Columbia.

Patrick: Why do you think this is the case?

Dr. Sultan: And I can speculate on the reasons for that. If you are trained to view the objective facts, to come up with solutions and right answers you don't easily adapt to a world where there are no right answers. Things are not black or white. There are shades of gray. What are the

right answers changes from time to time, leading to accusations that you are insincere.

Patrick: How does one come to terms with this as a professional in politics?

Dr. Sultan: A certain flexibility is inherent in the political profession. It is not the sort of flexibility that scientific training prepares you for. In fact this is an anathema. So very few engineers and scientists are drawn into politics. I appreciate that.

Patrick: But ... we live in a world defined by science and technology. Does this lack of expertise not cause problems?

Dr. Sultan: I do speculate on the problems which arise. The people who are in politics increasingly in this world must make decisions which are driven by the engineering and scientific facts. Whether we are talking about a subject as controversial, maybe, as global warming and what to do about it, to whether or not we should through policy force the transportation sector into a new form of motive power, whether it is hydrogen fuel cells, or the electric car. These decisions are massively influenced by Government and at the end of the day they are really highly technical decisions.

Patrick: This begs to the need that public office holders understand science and technology.

Dr. Sultan: The politicians are vulnerable to all sorts of snake oil salesman that come along and tell them this is the way to do it ... no, no, no do it this way. We want to convert the world to use wind power, or the current vogue, tidal power. Why not? Sounds good to me! So you come along and say well that's an option that can be done, but this is what it is going to cost. Others say, it really doesn't cost that much.

Patrick: What happens to the politicians that are caught in the middle?

Dr. Sultan: The politicians end up very confused! As I said, they can be persuaded to either defer any decision at all, which is I think what many politicians are inclined to do faced with uncertainty or to seize upon a solution and it may be years later before it is proven that wasn't a very good idea after all.

Patrick: Wouldn't a decision, no matter how uncertain, be sometimes better than no decision at all?

Dr. Sultan: As the world becomes what someone has described in a recent book a “flatter, hotter and more crowded” place the ability to quantify the trade offs ... in how we conduct our affairs ... I think becomes ever more important. We cannot fall back on unlimited resources as we have been inclined to do here in Canada or to

interview (continued)

think whatever we do, somehow things will work out ok. I think the margin of error is becoming thinner and we had better get it right, because if we don't get it right the consequences could be very bad for the human condition.

Patrick: What do you see in the road ahead?

Dr. Sultan: So, we have become more dependent on science and we hope that the politicians are smart enough to figure out what advice they should follow and what advice they should reject, as difficult as that may be. Interestingly, there are cases around the world where in fact scientists and engineers come to dominate political leadership, the most obvious example is in China, where until recently 100% percent of the membership of the Chinese Politburo, which runs this virtual dictatorship, has been made up of people with engineering training. And I think we see the consequences.

Patrick: In what way?

Dr. Sultan: "If we are going to build a high speed train from Shanghai to Beijing well we are going to do it and in fact we shall start in three months and have it done in eighteen months. Or we will build the world's tallest skyscraper."

Patrick: Or the world's biggest dam –the Three Gorges Dam.

Dr. Sultan: The Chinese have pole-vaulted to the front ranks of economic growth and now they are challenging the supremacy of the United States through the sheer magnitude of what they have accomplished. However, there is also a huge cost in terms of threatened stability, their civic institutions, some people get left behind. They clear the farmers off the fields and say, sorry a highway is coming through here and they don't worry too much about what these folks who have perhaps farmed those little plots of land for hundreds of years are going to do. It's not really part of their equation. Chinese engineers are going to get the job done and they do.

Patrick: What is that telling us?

Dr. Sultan: Even the Chinese are coming to the realization that you really need a blend of both approaches. You need people who have this humanist sensitivity while at the same time you need the engineers showing how to get the job done. I think the ideal government would in fact successfully blend those two approaches. And not just in an advisory capacity but in a decision-making capacity.

Patrick: If you were a young student entering, lets say UBC, U of T or McGill or some other Canadian university. Given what you have learned during your remarkable professional career would you do anything differently? And if so what advice would you a

young first year science or engineering student who is trying to chart out their future?

Dr. Sultan: Well it is always hard to imagine paths not taken. I have had a somewhat scenic highway that has taken me here and there. It wasn't very thought out in advance. It just happened. Brownian movement is what I think we were taught about in high school. One of the big lessons I quickly appreciated was my quantitative skills as developed through engineering. And to my astonishment, quite unexpected my ability to manipulate numbers and to understand the scale of a decision mentally, you know the consequences where the decimal point might go on a row of figures, if we were trying to figure out whether it made sense to introduce a new product for example in a business context, put me really in the front of the class. I was in fact in the top two or three of graduates at the Harvard Business School.

Patrick: Was there a specific person who mentored this or was this a skill you acquired on your own? Was there a book you read? How did you acquire this very important skill?

Dr. Sultan: Well I can't point to any individual but I felt it was forced upon us as a matter of survival in engineering school. If you could not do this you wouldn't graduate. In those days, perhaps not so much today, if you couldn't do the work you could not graduate. So it was bred into us. I think slide rules, as a matter of fact, helped even though they are quaint ... I pulled one out of my desk the other day and showed to my grand daughter ... she said what's that?

Patrick: When I was in high school I father proudly presented me with his slide rule telling me in earnest that I will need this in the years ahead. I learnt how to use it around the time the pocket calculator was coming in. I think I understand what you are saying about that sense of being able to understand the scale of things.

Dr. Sultan: I think this has been lost amongst students who have these pocket calculators. I can remember when pocket calculators came to Harvard. It presented a great moral dilemma as to whether we would let them be used in exams because at the time all students couldn't afford one.

Patrick: It's a numeracy thing then?

Dr. Sultan: Numeracy skills are universally applicable. When I entered the world of theoretical economics I was very fortunate because it was around the time that the leading edge developments in modern economics was mathematical economics. While I didn't have a highly developed set of tools in mathematics apart from my knowledge of applied science, I had sufficient

background to push me to the front row in the field of economics which was rapidly becoming a highly mathematical field. It stood me well over the years and I would really encourage young people to practice and cherish that ability to scope out in quantitative terms what's going on, because surprisingly enough you meet people who don't have a clue, particularly in politics. And you realize, how are they making decisions?

Patrick: Can you give us an example from your work in Victoria?

Dr. Sultan: From time to time I put up my hand in a committee meeting and they say ... this will cost about \$ 22,000 per disabled child the Province looks after, for life by the way ... and how many do we have? Oh ... five or six thousand ... and I say we can be talking, you know, about several hundred million dollars here. Oh that can't be right! Then they pull out their pencils and start jotting and they still can't figure it out. And I look at these programs and say yes they are necessary, I support them but has anyone thought through the long- term fiscal consequence? Because they don't really think that way.

Patrick: They see the tree but may not see the forest, and definitely don't see the hills that behind the trees and the forest.

Dr. Sultan: In so many ways Government sets out with all the best intentions in the world to do things to improve the human condition. You stand back and look at it and extrapolate five or ten years and ask where is the money going to come from?

Patrick: Thank you so much for letting CUPJ interview you today.

Dr. Sultan: I have enjoyed it thoroughly. I think the work you have done, particularly to encourage young physics students to explore the full dimensions of their field is admirable. So thank you for that.

Patrick: Your comments are much appreciated sir.

Patrick Bruskiewich is a doctoral candidate in nuclear astrophysics at UBC and at TRIUMF. He is also the Editor-in-Chief of the Canadian Undergraduate Physics Journal. He can be reached at patrickb@phas.ubc.ca