

NEWSLETTER

of Chartered Engineers

Winter 2013



Visit our website at www.cpgce.org

Chairman's Notes Winter 2013

Dear members

As this year draws to a close and the new year begins, we have time to reflect on the past and look forward to the new. For the CPGCE, 2012 was successful in that our technical meetings were all well attended with audiences ranging from about 30 to about 60. One of our sponsoring Institutions, the Institution of Engineering and Technology (IET rebranded from IEE), held a Present around the World (PATW) Americas Regional Final and a Community Volunteers Conference in Calgary in the early fall. Bob Enever gave a talk explaining what the CPGCE joint group was and how we functioned. There was a clear difference between his presentation of our organisation and activity level, and those of other members of IET struggling to get activities going in other parts of the Americas. Perhaps we will see the emergence of more joint groups like ours. With the new awareness of our existence and what we do, communication with the IET has increased considerably.

We may get a visit from the President of the Institution of Structural Engineers next year, as I understand the incoming president was a professor at the University of Calgary for some of his career.

Changes to the budgeting process produced a challenge and I would like

IN THIS NEWSLETTER

Chairman's Message	Page 1
2013 Annual General Meeting (AGM)	Page 2
2013 AGM Agenda	Page 2
2012 AGM Minutes	Page 2
2013 Technical Programme	Page 4
Mac Stenson	Page 5
Precast Segmental Bridge Construction	Page 6
IET PATW Conference	Page 8
Monitoring of Pipelines & Structures	Page 9
Project Management -Avoiding Failures of the Future	Page 10
Calgary Construction Highlights	Page 12
2012 Executive	Page 12

to thank our Treasurer, Bob Enever, for his perseverance, diligence and continued humour in the face of the increased paperwork. I would also take this opportunity to thank the rest of your executive for all their contributions over the year – for their hard work, willingness to volunteer and for maintaining their sense of humour.

The AGM will be held in early January – details elsewhere in the newsletter. Please attend this function and think about volunteering for the executive – new members are always welcome to help share the work and bring in fresh ideas. Please also find the time to attend the technical meetings – the first few for next year provide an excellent diversity of topics and we hope they will be of interest to you.

On behalf of your executive, I wish you all a very productive and enjoyable New Year

Nigel

2013 Annual General Meeting (AGM) and Dinner

**Fort Calgary, 750 - 9th Avenue SE,
Calgary, Alberta, T2G 5E1**



**Saturday 26st January 2013
Meet at 6:00pm for AGM at 6.30 pm
Buffet Dinner at 7.00 pm**

**RSVP CPGCE Secretary via
E-mail: [Secretary](#) on the website
or phone Tel.: 403 254 3315**

**Please confirm your attendance before 20th
January 2013.**

**Our AGM after-dinner speaker this year will
be Teresa Almond B. Arch**



TERRY ALMOND M.A.A.A.

Teresa Almond is a Calgary based architect with her own Practice and is an Instructor on Interior Design at Mount Royal University. She is a consultant to the federal government on historic buildings in this region that has included the unique problems of preserving structures associated with historic hot springs in Banff and Radium.

She will make a presentation titled
Heritage in Context - A Western Federal Experience

Canadian Prairies Group of Chartered Engineers (CPGCE)

**AGM Agenda for
Saturday, January 26, 2013 6.30 PM**

1. APPROVAL of AGENDA
2. APOLOGIES for ABSENCE
3. MINUTES of PREVIOUS MEETING
4. MATTERS ARISING FROM MINUTES
5. APPROVAL of MINUTES
6. CHAIRMAN'S REPORT
7. TREASURER'S REPORT
8. SECRETARY'S REPORT
9. ELECTION of OFFICERS
 - Chairman Nigel Shrive
 - Vice Chairman Vacant
 - Past Chairman Vacant
 - Treasurer Bob Enever
 - Secretary Colin Pollard
 - Members Teddy Arevalo
Adrian Dumbrava
Alan Deazeley
Mohamed Jaffer
Arun Kumar
Tom Martin
Bob Sparrow
Maina Waiguru

10. INCOMING CHAIRMAN'S REMARKS

Canadian Prairies Group of Chartered Engineers

**Minutes of Annual General Meeting
January 21, 2012, 18.30 hrs.**

Held at Canyon Meadows Golf Club, Calgary, Alberta, Canada.

Committee members present: T Arevalo, A Dumbrava, R Enever, M Jaffer, A Kumar, C Pollard, T Martin, N Shrive, R Sparrow, M Waiguru.

1 Approval of Agenda

The agenda was approved.

3 Minutes of the last AGM (January, 2011)

Accepted as a true record.
Proposed M Jaffer

Seconded O Malik

4 Matters arising from previous minutes

A question was raised about any progress with the IChemE's withdrawal of sponsorship. The chairman reported no progress had been made.

5 Chairman's Report

N Shrive presented a report covering the following subjects:

It had been a busy year and attendance at technical meetings had remained good with attendance typically over 40.

Thanks were extended to the Committee for their work in the past year.

6 Treasurer's Report.

R Enever presented a report:

6.1 Financial status is good and money has been received from London as usual.

7 Secretary's Report

C Pollard presented a report covering the following subjects

7.1 Nine committee meetings have been held in the past year. The principal subjects were the scholarship fund and technical meetings.

7.2 Correspondence with London had been sparse with no problem issues.

7.3 No Presidents of the sponsoring Institutions had visited in 2011.

7.4 Correspondence from members had reduced slightly this year and primarily related to possible immigration to and work practices in Canada from UK based engineers. Where I had not been able to provide assistance the message had been passed on to the appropriate Institution representative in Calgary.

7.5. I would like to record my thanks to all on the Committee for assistance in performing the function of Secretary. It is made considerably less onerous by Adrian Dumbrava's handling of everything related to our scholarship, Arun Kumar's handling of the web site and Bob Enever producing the Newsletter.

8 Scholarship Fund Report.

Adrian Dumbrava presented a report:

8.1 17 applications for the Scholarship had been received.

8.2 The standard had been high and had presented a significant challenge to the Sub-Committee in selecting a winner.

8.3. Many applications with excellent qualifications have been received

8.4 Two applications had been received from a brother and sister

8.4 The winner of the Charles Dempsey Scholarship for 2011 was Graeme Prosperi-Porta a third year Materials Engineering student at the University of Alberta.

9 Election of Officers

9.1 Nigel Shrive officiated

9.2 Nominations were requested and the following were elected by acclamation

Chairman	Nigel Shrive
Vice Chairman	Vacant
Past Chairman	Vacant
Treasurer	Bob Enever
Secretary	Colin Pollard
Members	

Teddy Arevalo,
Alan Deazeley,
Adrian Dumbrava
Mohamed Jaffer
Arun Kumar
Tom Martin

Bob Sparrow
Maina Waiguru

Meeting adjourned at 18.50 hrs.

2013 Technical Programme

Wednesday, 13th February 2013

The Science of Climate Change - Two Perspectives

Dr Shawn Marshall and Dr Neil Hutton



Dr Shawn Marshall, Canada Research Chair on Climate Change, Department of Geography, University of Calgary.

Dr Neil Hutton, Past President, Canadian Society of Petroleum Geologists

These two speakers agree that our climate is changing and that the cause of the warming since 1950 is open to debate. Each will present scientific evidence and their interpretation of the data as to whether the warming over the last sixty years is driven in the main by CO² or not. Dr Marshall will provide evidence supporting CO² as a major contributor and Dr Hutton will provide evidence to the contrary.

Each speaker will present for 20 minutes. There will be 20 minutes for questions from the audience and then each speaker will summarise their perspective in light of the discussion. The executive hopes that this format will provide members with the relevant scientific facts, and show how different interpretations can be made. Members will then

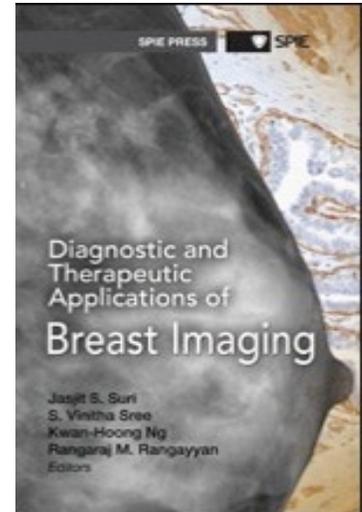
be informed and able to sort out hype from reality as reported in the media.

Wednesday, 13th March 2013

Computer-aided Detection of Subtle Signs of Breast Cancer in Mammograms

Rangaraj M. Rangayyan, PhD

Dr Rangayyan is a Professor with the Department of Electrical and Computer Engineering, and an Adjunct Professor of Surgery and Radiology, at the University of Calgary, Calgary, Alberta, Canada.



Architectural distortion is a subtle sign of breast cancer that could be missed in screening mammography. This seminar will present several techniques for the detection of architectural distortion in mammograms based on the analysis of oriented texture using Gabor filters, modelling of orientation fields by phase portraits, and modelling of the oriented structure of breast tissues.

mammograms obtained prior to the detection of cancer could contain subtle signs of breast cancer, in particular, architectural distortion. Several methods will be described for the characterisation of architectural distortion based on the analysis of the angular spread of power and other characteristics, fractal analysis, texture analysis, and measures of divergence. With a dataset of 106 prior mammograms of 56 interval-cancer cases and 52 mammograms of 13 normal cases, area under the receiver operating characteristic curve of up to 0.78 has been obtained. Free-response receiver operating characteristics have indicated sensitivity of 0.80 at fewer than 4 false positives per patient. The results

Screening

indicate that the methods proposed can help in the detection of breast cancer at earlier stages than possible by visual interpretation.

Wednesday, April 10, 2013

Calgary Airport tunnel

Andrew Boucher, PEng Project Manager at CH2MHILL



The presentation will cover the engineering and design issues for both future road and LRT traffic and upcoming construction challenges.

Wednesday, May 9, 2013 and

Subject to be confirmed

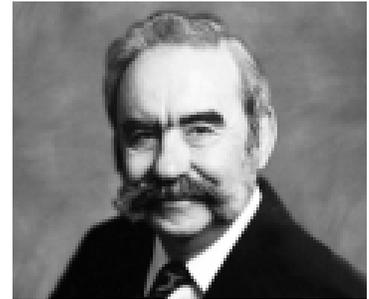
Wednesday, June 13, 2013

Subject to be confirmed

The CPGCE is always looking for interesting engineering and scientific topics for presentations. If you have any ideas, suggestions or requests, please contact any member of the CPGCE executive.

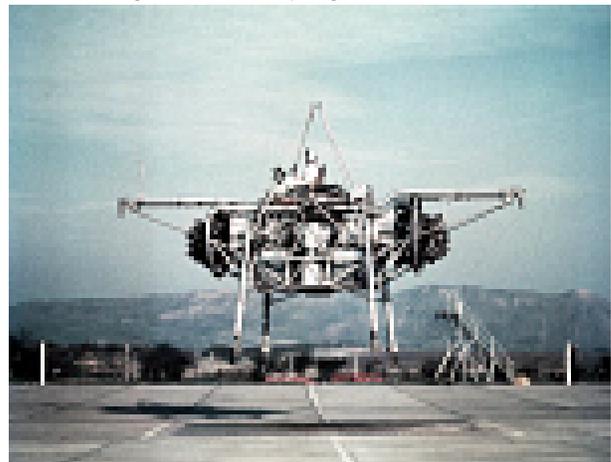
Obituary Mac Stenson

Mac Stenson passed away on Tuesday, June 5, 2012 at the age of 86 years. Mac immigrated to Canada in 1963 and worked as a Professional Engineer for



Rolls Royce and Pratt & Whitney. Mac had a long involvement with the CPGCE and managed our website in its earliest form back in the 1990s.

While in the UK he was a part of the development team with Rolls Royce of a 'flying' thrust measuring rig (TMR). This became known colloquially as "the flying bedstead" in the popular press. Mac was actively involved in the design and testing of the vertical take-off and landing (VTOL) propulsion jets. He made an excellent presentation on the development of this technology and had an original film of the test flights of the flying bedstead.



Rolls Royce TMR aka 'The Flying Bedstead' 1955

Mac was a true character, a lover of life, who never lost his curiosity, sense of adventure or his desire for continuous learning. He was a regular member of the audience at out technical presentations for the past two decades and will be missed.

Wednesday September 12, 2012

Precast Segmental Bridge Construction

**Ed Lam, P Eng MICE,
AMEC Americas**

Ed Lam told us about his work experience on multi-span bridges in Hong Kong and Singapore where he spent periods of two and twelve years respectively working for a large engineering and construction company

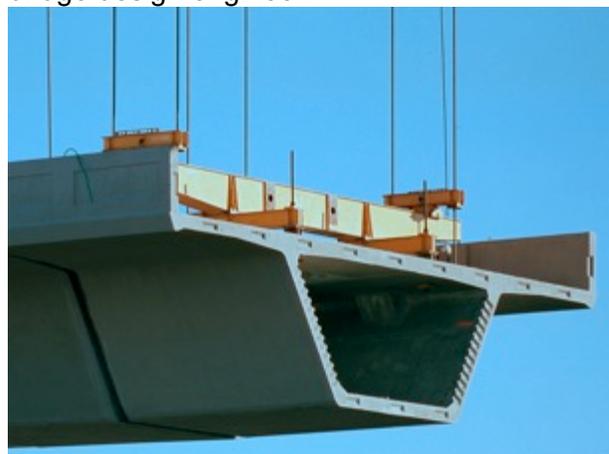
Ed commenced the presentation with a brief overview of the construction of multi span highway and rail bridges, using post-tensioned concrete box girders. Unfortunately, he could not make the many photographs he used to illustrate his presentation available for this summary but these did include complex multilane highways built over existing roads, railways and rivers. The general ideas were similar to the elevated section of the west leg of the LRT currently under construction in Calgary. The writer includes his personal photographs of the Calgary West Leg for illustration.

Segmental construction is economic only when there is an opportunity for a large amount of repetition. The two main requirements are (1) a casting yard within reasonable distance of the construction site and (2) the availability of large gantries for lifting and suspending the segments one by one or in groups as they are arranged between the piers.



Photograph 1

Ed described how the individual precast concrete segments are joined together to form either a series of simply supported beams between piers or a continuous beam spanning over several piers. Rather than being connected together with reinforced joints, the segments are post tensioned together with high strength cables, which pass through the beam sections from end to end. The principle of post-tensioned concrete recognises that beams bend under loads. Bending causes longitudinal compressive stresses at either the top or bottom flange of a beam with, simultaneously, tensile stresses at the opposite flange. These stresses vary in amount with their position along the beam and also with the traffic on the finished structure. In order to safely balance the loads, the concrete compressive stress must be held above zero and under the strength of the concrete during construction and during its service life. The tensile stresses are managed by the steel cables, which initially create the concrete compression and then provide sufficient additional force for future live load, shrinkage of the concrete and thermal changes due to weather. The numbers and positions of the cables are designed to produce enough but not too much force in the concrete. The art of balancing the forces produced by the cables with the shape of the concrete is the task of a bridge design engineer.



Photograph 2

There are two common systems of building segmental bridges using this method. The first is 'span by span' construction where the segments are lifted into position from an overhead gantry, which spans across the piers.

Photograph 1 shows several segments suspended from a set of cables. Once all the segments are suspended in place they will be clamped together to properly mate one with another and then they will be stressed together.

The stressing cables are housed in tubes or ducts, which, after stressing, are filled with a corrosive inhibitor – possibly a cement grout. The ducts are often cast into the concrete webs and flanges. In this example, see Photograph 2, the concrete sections have solid walls and, the ducts are in the box section and will pass through ‘blisters’ cast onto the walls of the box sections. At the mating faces of the segments, keys are cast in the concrete. These have opposite male-female patterns in the mating segment to ensure proper alignment of the segments. Joints may be sealed with epoxy adhesives but in some cases are not. In many applications, subsequent segmental castings are poured against the previously completed segment in the casting yard to create a near perfect match. This requires very careful logistics both during manufacture, storage and erection. The stressing operation is accomplished using hydraulic jacks. First the cables, each made up from a group of steel strands, are passed through the girder through the duct system. Once in place, they are clamped at the dead end and to the jack at the live end. The jack is then extended and the cables are fixed in place with conically shaped wedges in a steel bearing plate. This allows the jack to be released without the tendon losing its extension and force. This operation is



Photograph 3

repeated for the number of cables being used. Each group of strand in a duct is termed a tendon. The sequence of stressing tendons is arranged to ensure no local overstress of concrete occurs. On completion of the stressing, the completed span can be lowered onto the permanent bearings that support the superstructure on the pier.



Photograph 4

The second system for erecting the segments is illustrated in Photographs 3 and 4. Photograph 3 shows that a gantry is still needed but in this case it is required to lift only one or perhaps two superstructure segments at any one time. Also the first segment may be part of the pier and pairs of segments are then attached to this central segment to balance one another and not create overturning forces in the pier because of eccentric loading. This system is particularly suitable for larger spans and where access below the girder is difficult or impossible.

With two segments suspended from the gantry, cables are threaded through the segments and they are stressed together to form a tee top to the pier. Photograph 4 shows a segment about to be lifted. The top flange of this segment has several holes through which temporary cables will be passed for holding it and each of the subsequent pairs of segments as the tee expands.

A similar operation must be carried out on the next pier and, eventually, there will remain only a small gap of about 100 mm near mid-span, which will be filled with concrete to create a

continuous girder. In this case the post-tensioning will be through several span lengths from one movement joint in the superstructure to the next.

While the concept is simple enough to understand, the construction challenges are not insignificant. Curved bridges are built as well as straight and in each case the control of alignment is critical. The contractor must not allow the alignment to creep off the design centreline. In the case of two balanced cantilevers on a curve, accurate meeting is critical. Measurement must be made at night when the concrete is all at one temperature and no gradient is present across the sections. Vertical alignment must be maintained as well as the horizontal.

Photos: Tom Martin

Weekend September 14-16, 2012

IET Present around the World (PATW) and Americas Community Volunteer Conference (CVCs) in Calgary

The Institution of Engineering and Technology (IET which is the rebranded IEE) has an international campaign to increase its worldwide presence by staging an annual global competition for students, recent graduates, apprentices and young professionals aged 18-26 years.

Following successful Community Volunteer Conferences (CVCs) for the IET's South Asia and Europe, Middle East and Africa regions, the three-day Americas CVC took place in Calgary from Friday 14 September at The Palliser Hotel.

The weekend event started with a meeting of the IET's Americas Communities Committee, which demonstrated the strength of the IET volunteer base in this region.

Saturday 15 September saw the Present around the World the (PATW) final for the region, with over 50 people in attendance from the Caribbean, United States of America and Canada. Drew Noble (chair of Communities Committee Americas, CC-A) took the

opportunity in his introduction to pass on the latest news on the IET Strategy for the 21st Century, which led to a lively question and answers overseen by Drew and Steve Perry, head of sectors and communities for the IET.

The 10 PATW finalists, all enthusiastic IET Young Professionals (YPs), then delivered their presentations, with topics ranging from parallel processors to urban vertical farming units. Drew Noble said: "The quality of not only the content, but the presentation styles, was fantastic, giving the judges an extremely difficult task to select one winner."



Mike DuVall of the University of Calgary was ultimately named the regional winner for his excellent presentation on the role the protein group titin performs in muscle contraction.

For the afternoon, the Young Professional Regional Committee, led by Alyssa Randall, organised a series of presentations on YP volunteering. Topics included how to organise a PATW, working with Canadian Student

Engineering organisations, and how to start YP groups at universities.



The next day saw a video update from IET president Andy Hopper and chief executive Nigel Fine, and then a presentation from Steve Perry on the IET's communities team, volunteer/staff governance structure and plans for the future. Hudson Egbert then talked about the IET's international strategy and there were panel discussions on developing new communities and re-energising existing ones.

The CPGCE made a presentation about its unique organisation of the four contributing UK Institutions of Civil, Mechanical, Structural, Engineering and Technology and covered its current programme of activities and services it provided for Western Canada. Nigel Shrive, Roy Marsh and Bob Enever represented the CPGCE at this conference.

Wednesday, October 10, 2012.

Monitoring of Pipelines & Structures

**Jack Elliott, P Eng,
President, Pure Technologies Ltd.**

Jack Elliott talked about the development of Pure Technologies (Pure) from a small Calgary based start up company in the mid-1990s to a world leader in the application of innovative non-destructive inspection, monitoring and management techniques for buildings, bridges and pipelines.

Pure introduced in 1994 the use of patented passive acoustic (SoundPrint) monitoring system to continuously 'listen' for failures in high strength post tensioned tendons. This hidden corrosion problem with post tensioned concrete was prevalent especially for car park structures. Moisture ingress into the tendons induces corrosion without any external visible signs. Tendon failures produce explosive energy reports, which are detected using acoustic sensors strategically installed at the slab soffit and monitored by computers.

Alternative investigatory methods are incapable



Acoustic sensor on the Quincy Bayview Bridge linked to a SoundPrint system

of detecting these failures and require the physical exposure of the tendons. This method of repair often results in replacing 'healthy' tendons as along with the failed. This is not cost effective.

Unfortunately the majority of owners are not interested in monitoring post tensioned structures. Pure diversified the application of their technology to pre-stressed and cable supported bridges as well as pre-stressed concrete pipelines.

Jack described the main causes of corrosion on the high strength steel used in tendons and cables. Hydrogen embrittlement under moist conditions causes the steel's metallurgy to lose ductility and become brittle, resulting in cracks over time. Steel dissolution (rusting), will develop in inadequately grouted tendons where moisture accumulates in the ducts.

The United Kingdom had problems with supposedly grouted tendon in bridges. Two bridge collapses in the 1970s and 1980s, which prompted a major review of the post-tensioned design and construction. Pure worked with UK's Transport Research Laboratory in some of these reviews. Protection of main cables for suspension bridges was considered inadequate under some exposure conditions. Jack illustrated corrosion failure of some wires during an ocular inspection of a cable.

Jack gave examples of some bridges they monitored including one span of the cable-stayed bridges for the spectacular Millau Viaduct in Southern France. As an extreme example of failures, all the Diwydag high strength bars cables were replaced for the Penang Bridge in Malaysia. The Fred Hartman Bridge (cable stayed) experienced severe vibration of the stays. Pure assisted the University of Texas in monitoring cables as part of a fatigue study.

Jack showed a sample of their uniaxial piezo-electric sensor. The SoundPrint system uses the arrival time of the detected shockwave from the failure to calculate the failure location. Signals are multiplexed to reduce the number

of channels for monitoring the hundreds of sensors used. Pure then advises their client on the consequences of a detected wire/tendon failure.

Pure expanded its monitoring services to include large diameter pre-stressed concrete pipe. These are precast pipes wrapped with helical pre-stressing strands with a shotcrete cover. The shotcrete is not always adequate protection against corrosive soil conditions. A pressured pre-stressed concrete pipe can fail catastrophically if the steel reinforcement corrodes badly. This happened near the Calgary airport in January 2004.

To assess the condition of the steel reinforcement in pre-stressed concrete pipes, Pure applies P-wave technology using electromagnetic pulses induced into the helical wire of the pipe. A receiver is moved along the pipe to monitor the signals and determine the number and location of failed strands. Repairs must then be implemented to prevent pipe failure.

Jack also produced a sample of a revolutionary optical cable with distributed dual acoustic sensors that could be routed continuously along pipelines for up to 40km. Thousands of kilometres of cables have been installed in Libya (which has extensive underground water pipe lines) and in North America to provide an early warning system.



Other innovative technologies for the inspection of 'hot' pipes were covered including the PipeDiver and the SmartBall. These inspection and leak detection systems enable pipelines to be assessed without

costly shutdowns.

Jack remarked that the success of Pure's business is attributed to their ability to adapt their innovative products and services to the market needs. Their business plan in 1997 has little resemblance to the work being done by Pure today.

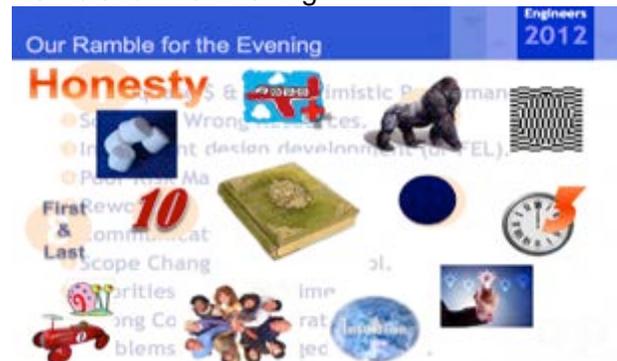
Wednesday, November 14th, 2012

Project Management - Avoiding Failures of the Future?

Francis Hartman FICE, P Eng
President of Quality Enhanced Decisions Inc. and Smart Management Inc.

Francis Hartman lived up to expectations and gave an entertaining yet thought provoking presentation about the failures of current project management. His opening statement began "*..as seasoned professionals we continue to manage and execute projects to a rigorous process of project management, which appears to ensure that we repeat all previous shortcomings in execution*" set the tone of the presentation.

His exposition included many graphics, which are not easily described, to illustrate arguments. The key slide was titled 'Our Ramble for the Evening'.



Dr Hartman's key headings and their refinement in the presentation of his 10 project execution deficiencies are in bold followed by an audience's interpretation?

Assumption: If we are here we have brains.

That was the assumption Dr Hartman proposed and he went to state for every project:

- We repeat the same 10 lessons(not learnt);**
- 1) Inadequate \$(cost) & T(schedule) & Optimistic Performance**
 - 2) Scarce or Wrong Resources**

- 3) **Insufficient design development (or Front End Loading)**
- 4) **Poor Risk Management**
- 5) **Rework**
- 6) **Communication breakdown**
- 7) **Scope Changes out of Control**
- 8) **Priorities shift over time**
- 9) **Wrong Contracting Strategy**
- 10) **Problems acknowledged too late....**

He followed up with the reasons why we repeat the lessons.

Pattern, habit or focus? Project team members focus on different issues and each team player will see an event in a different light.

Being heroes and selective memory....

As a project passes through the phases of execution, team members want to be associated with the successes and will 'forget' the failures.

Dopamine, serotonin, scopolamine and erythropoietin and... These are the self generated internal drug highs that motivate the project team.



Ever heard of Men's Intuition?

We are OK with "Gut Feel" and "From the Heart" Methodologies for bypassing logical decision making.

The role of stories....

Our stories are often Enhanced Truth. As in wars the winner gets to write the history.

We like "quick hits" (or instant gratification)

A quick fix make project manger look decisive and in control.

Endings are critical. We can overcome bad starts. Belief of project teams that it is important to keep moving forward to meet the schedule rather than ensuring all tasks are completed at each stage; specifically we put insufficient effort into the initial phase.

We are sadly predictable. And we do not like change. One can never be faulted for following the proven project procedures.

If a million people are wrong, that does not make them right! Just because the majority or even a large number of projects are executed incorrectly this does not make their process one to be followed.

Time improves decisions. So we rush decisions or re-use old ones. We know that a well thought out solution is best and takes time. Instead we rush into decision making often basing it on previous experience, which can perpetuate previous errors.

Common goals and consensus are KEY. NOT confrontation and conflicting goals. This would seem to be self-evident but unfortunately egos always seem to be more important.

Not all professional practice is brilliant or perfect. The reality is that many good project management and engineering decisions are compromises.

RELATIONSHIPS put lawyers out of business. Establish good working relationship between all project stakeholders then contentious issues and disputes requiring legal 'assistance' will be minimised. Hopefully lawyers will not be required.

It is difficult to do justice to Dr Hartman's presentation as a reporter and it has to be experienced in person to benefit from his dynamic and stimulating exposition

The packed audience gave an ovation to Dr Hartman. The tenor of Dr Hartman's presentation is best captured by his book; 'Don't Park Your Brain Outside'. He gave out many free copies to the audience.

Calgary Construction Highlights- Two major engineering projects were essentially completed in Calgary in 2012



The Bow 58 storey tower



The 8km West Leg of Calgary's Light Rail Transit



Sunalta LRT station

The CPGCE Executive as of January 2012

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Tom	MARTIN	403	246 1542	tmconsultants@shaw.ca	Ci	Deputy Treasurer
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