



# Canadian Workshop on Fusion Energy Science and Technology



## CWFEST-2013

Friday, August 30, 2013, 8 am to 5 pm

UOIT – Oshawa, ON, Canada

**Sponsors:** Canadian Nuclear Society, CNS-UOIT Branch, IEEE-Toronto, PES / NPSS Chapters

**Co-chairs:** Professor Hossam Gaber (UOIT), Dr. Blair P. Bromley (AECL/CRL)

**Contacts:** [Hossam.Gaber@uoit.ca](mailto:Hossam.Gaber@uoit.ca), [bromleyb@aecl.ca](mailto:bromleyb@aecl.ca)

**Registration:** \$50 (discounts for SEGE'13 registrants, students, IEEE/CNS members)

To register: visit <http://ewh.ieee.org/conf/sege/2013/CWFEST.html>

*CWFEST scheduled in conjunction with IEEE International Conference on Smart Energy Grid Engineering (SEGE'13), scheduled for Aug. 28-30, 2013 at UOIT.*

*Information and updates, visit: <http://ewh.ieee.org/conf/sege/2013/> and also <http://cns-snc.ca/home>*

*Canadian Nuclear Society, IEEE-SEGE-2013*



# CWFEST-2013

## Registration Fees

**\$50 – Regular**

**\$40 – IEEE or CNS Members**

**\$30 – Students**

**\$20 – Students who are IEEE or CNS Members**

**\$0 – SEGE'13 Registrants (still must register), CWFEST Speakers**

**Space is Limited (60 to 100 max)**

## Registration Deadline

**Wednesday, August 21, 2013**

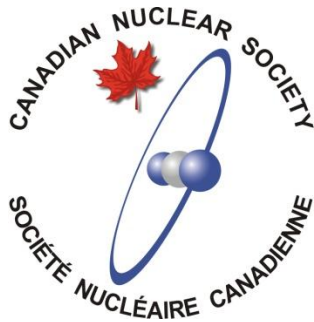


# CWFEST-2013

## How to Register



- **Go to registration website for SEGE'13:**
  - <http://ewh.ieee.org/conf/sege/2013/CWFEST.html>
    - Fill in information boxes appropriate for CWFEST-2013.
  - **!!! In addition, send emails to the following to confirm your registration:**
    - [Hossam.Gaber@uoit.ca](mailto:Hossam.Gaber@uoit.ca) , [bromleyb@aecl.ca](mailto:bromleyb@aecl.ca), [uoit@cns-snc.ca](mailto:uoit@cns-snc.ca)
  - Even if you are already registered for SEGE'13, you must also register for CWFEST-2013 if you want to attend. Send an email to the above email addresses to confirm your registration.
- **To get discount for IEEE/CNS members and students, provide evidence:**
  - CNS (or IEEE) membership number (or other record) confirming membership in good standing for 2013.
  - Email from university (or other record) confirming enrollment in 2013.
    - Attach information as a pdf file.



# CWFEST-2013 Location - UOIT



- North Campus
- 2000 Simcoe Street North  
Oshawa, Ontario, L1H 7K4

- [uoit@cns-snc.ca](mailto:uoit@cns-snc.ca)
- <http://uoit.ca/maps/uoit/>
- <http://www.uoit.ca/maps/print/NorthOshawaCampusMap.pdf>

- Parking lots available.
- Room JW201

— A 3-minute walk from the  
**SEGE'13 Conference  
Rooms**

## NORTH OSHAWA LOCATION MAP

2000 Simcoe Street North, Oshawa, Ontario L1H 7K4 | www.uoit.ca | T 905.721.8668

FOR DRIVING DIRECTIONS SEE NEXT PAGE



UNIVERSITY OF ONTARIO  
INSTITUTE OF TECHNOLOGY

REVISED OCTOBER 2011



# CWFEST-2013

## Location - Directions

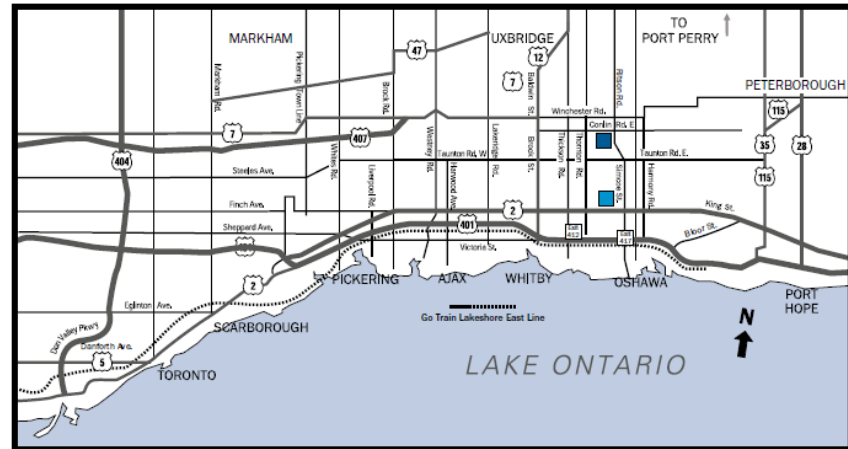
- North Campus at UOIT.
- <http://uoit.ca/maps/print/NorthOshawaCampusMap.pdf>



### DIRECTIONS TO NORTH OSHAWA LOCATION

2000 Simcoe Street North, Oshawa, Ontario L1H 7K4 | www.uoit.ca | T 905.721.8668

- UOIT North campus location
- UOIT Downtown campus location



#### DRIVING FROM TORONTO, VIA HIGHWAY 401:

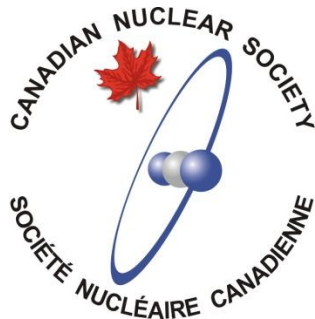
- Highway 401 east to Thickson Road (exit #412).
- North on Thickson eight kilometres to Conlin Road.
- East on Conlin 3.5 kilometres to Simcoe Street North.
- The university is located on the southwest corner of Simcoe and Conlin.

#### DRIVING FROM TORONTO, VIA HIGHWAY 407:

- Highway 407 east to the end of the highway (at Brock Road in Pickering).
- Continue straight (eastbound) along Highway 7, which becomes Winchester Road in the community of Brooklin (at Baldwin Street).
- Continue east on Winchester to Simcoe Street (total distance from Brock Road to Simcoe Street: approximately 17 kilometres).
- South on Simcoe 2.5 kilometres to Conlin Road.
- The university is located on the southwest corner of Simcoe and Conlin.

#### DRIVING FROM KINGSTON/OTTAWA, VIA HIGHWAY 401:

- Hwy. 401 west to Simcoe Street/Ritson Road (exit #418).
- Follow signage to Simcoe Street (from off ramp, go straight 0.2 kilometres, then turn left on First Avenue. Go west 0.5 kilometres on First Avenue to Simcoe).
- North on Simcoe Street, eight kilometres (past Taunton Road) to just south of Conlin Road.
- The university is located on the southwest corner of Simcoe and Conlin.



# CWFEST-2013

## Accommodations in Oshawa

- Residence & Conference Centre – Oshawa, 32 Commencement Drive, Oshawa, ON L1G 8G3, 905-728-8700 ext. 8707 Reservations: 1-877-225-8664 [mmarkovic@stayrcc.com](mailto:mmarkovic@stayrcc.com), [www.stayrcc.com](http://www.stayrcc.com), ~\$60/night.
- Best Western Plus Durham Hotel & Conference Centre 559 Bloor St W, Oshawa, ON L1J 5Y6 (905) 723-5271 Rates: \$99 – 119.99 per night
- Comfort Inn Oshawa 605 Bloor St W, Oshawa, ON L1J 5Y6 (905) 434-5000 Rates: \$99 – 103.99
- Travelodge Oshawa Whitby 940 Champlain Ave, Oshawa, ON L1J 7A6 (905) 436-9500 Rates: \$109 - \$139
- Knights Inn Oshawa 695 King St E, Oshawa, ON L1H 1G8 (905) 436-1020 Rates: \$69 - \$79
- Quality Hotel and Conference Centre 1011 Bloor St E, Oshawa, ON L1H 7K6 (905) 576-5101
- Sleep Inn Oshawa 394 Simcoe S, Oshawa, ON L1H 4J4 (905) 576-0555
- Quality Suites Whitby 1700 Champlain Ave, Whitby, ON L1N 6A7 (905) 432-8800 Rates: \$144.99 - \$169.99
- Holiday Inn Express Whitby Oshawa 180 Consumers Dr, Whitby, ON L1N 9S3 (905) 665-8400 Rates: \$149.99 - \$200.00



# CWFEST-2013



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## Tentative Schedule

**7:30 am - 9:00 am: Registration, Check-in, Meet & Greet**

**9:00 am – 9:30 am: Introductions, Message from MPP.**

**9:30 am - 12:15 pm: 4 speakers + panel discussion.**

**12:15 pm - 1:00 pm: Lunch**

**1:00 pm - 4:15 pm: 5 speakers + panel discussion**

**3:30 pm - 3:45 pm: Coffee Break**

**4:15 pm - 5:00 pm : Wrap-up, Closeout, Group Photos**



# CWFEST-2013



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## Speakers

- **Hon. Donna Cansfield**
  - MPP-Etobicoke Centre, Government of Ontario.
- **Professor Brent Lewis**
  - Dean, Faculty of Energy Systems and Nuclear Science
- **Dr. Henry Xianjun Zheng, Chief Scientist, HOPE Innovations Inc., Mississauga, ON**
  - Fusion using focal region of multiple high current plasma beams.
- **Mr. Michael Delage, VP, General Fusion, Burnaby, BC.**
  - Acoustically-Driven Magnetized Target Fusion.
- **Professor Robert Fedosejevs, Depart. Elec./Comp. Engineering, U. Alberta**
  - Laser Inertial Confinement Fusion - Advanced Ignition Techniques.
- **Professor Chijin Xiao, Department of Physics, University of Saskatchewan**
  - Magnetic Fusion and Tokamak Devices





# CWFEST-2013



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## Speakers (Continued)

- **Mr. Pat Carle, Department of Physics, Queen's University, Kingston, ON**
  - Plasma Diagnostics in Fusion Energy Research.
- **Dr. Hamid Shahani, President, Norax Canada, Saint-Romuald, QC**
  - Engineering Issues in Fusion Reactor Design and Alternative Concepts.
- **Mr. Richard Barnes, ANRIC Enterprises Inc., Toronto, ON**
  - Development of Standards in Fusion Reactor Technology.
- **Dr. Hugh Boniface / Dr. Sam Suppiah, AECL – Chalk River Laboratories, ON**
  - Tritium Handling Technologies.
- **Dr. Andrew Davis, Engineering Physics Department, University of Wisconsin**
  - Fusion Neutronics Issues and Developments
  - International Perspectives on Fusion Energy Development



# CWFEST-2013



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## Roles and Activities for Speaker:

- Give 25 minute presentation + 5 minutes for immediate questions.
- Description of their work relating to fusion energy S&T.
- Status report on progress (past and present).
- Key technical and non-technical issues to address.
- Plans for the future.
- Perspective on lessons learned, where things are going, what can be done, options for Canada & abroad.
- Be part of panel discussion and Q&A session.



# Fusion Using Focal Region of Multiple High Current Plasma Beams.



## Dr. Henry Zheng

- As Chief Scientist of HOPE Innovations Inc. based in Mississauga, Ontario, he is developing a new approach to nuclear fusion energy generation. Dr. Zheng filed patent applications in US, China and internationally for a new system achieving continuous, stable and clean fusion reactions in the common focal region of multiple high current plasma beams symmetric in 3D space.
- Dr. Zheng is a scientist, nuclear engineer / senior consultant in the Canadian nuclear industry since 1993. He worked for Kinectrics, OPG, Nuclear Safety Solutions, Bruce Power, AECL and SNC-Lavalin on many fuel channel projects to support the continued operation of CANDU reactors. He received his Ph.D. degree from the University of Waterloo after studying the fracture mechanisms of Delayed Hydride Cracking in zirconium pressure tubes.





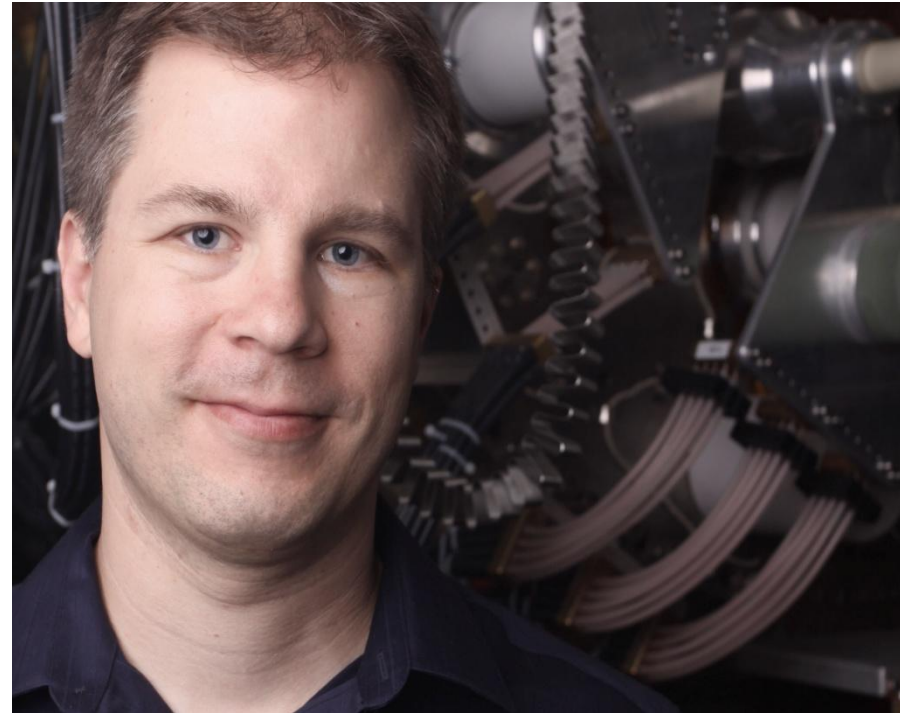
# Acoustically-Driven Magnetized Target Fusion



**Mr. Michael Delage**

**VP, General Fusion, Burnaby, BC.**

- **As VP, responsible for corporate strategy and industry partnerships, to bring technology to market.**
- **Co-founded Energate Inc. in 2004 .**
- **Worked previously with Skulogix Inc., Dynacon Systems, and Spar Aerospace.**
- **B.Sc. in Engineering Physics and an M.B.A. from Queen's University.**





# Laser Inertial Confinement Fusion - Advanced Ignition Techniques



## Professor Robert Fedosejevs

- Department of Electrical and Computer Engineering, University of Alberta.
- VP, Canadian Association of Physicists
- BSc and PhD, University of Toronto
- 1974 – present, research on laser plasma interactions related to laser fusion: (absorption, hydrodynamics, x-rays, particle generation, laser-plasma instabilities, fast ignition and shock ignition)
- Infrared CO<sub>2</sub> lasers; ultraviolet KrF lasers; ultra-short Petawatt glass laser systems.



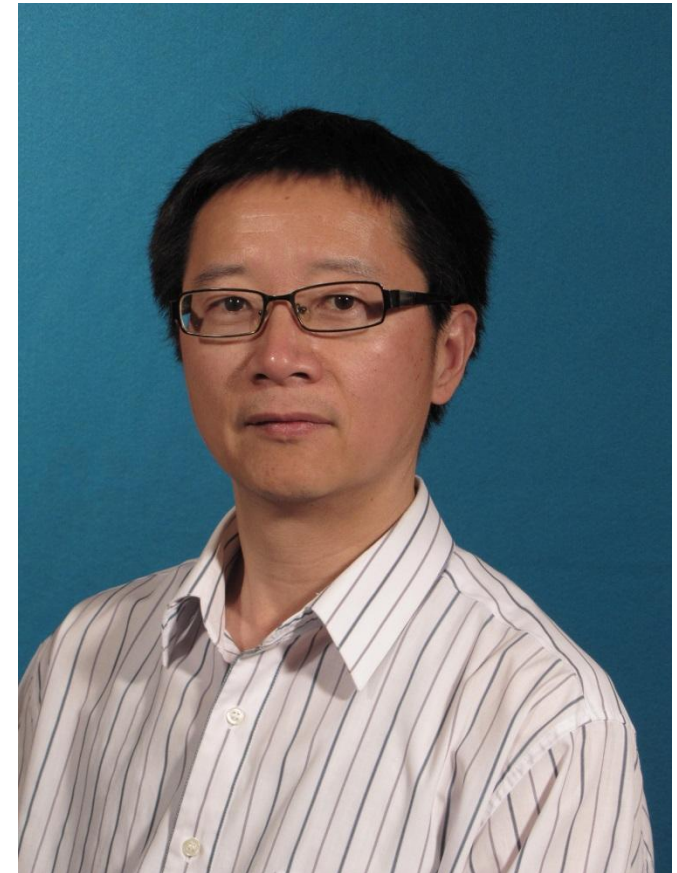


# Magnetic Fusion and Tokamak Devices



## Professor Chijin Xiao

- Department of Physics and Engineering Physics, University of Saskatchewan
- B.Sc., M. Sc., University of Science and Technology of China, Hefei, China
- Dr. rer. nat. (Ph.D.), Ruhr University Bochum.
- Chair, Division of Plasma Physics, CAP.
- Plasma physics and engineering for fusion, industrial and medical applications.
- Tokamak research, compact torus injection, plasma aided chemical vapor deposition, dense plasma focus.





# Plasma Diagnostics in Fusion Energy Research



## Mr. Pat Carle

- Department of Physics.
- Queen's University, Kingston, ON
- Patrick Carle is a PhD candidate.
- He has been working in partnership with General Fusion since 2010 to build a polarimeter for use in diagnosing accelerated spheromak plasmas.





# Engineering Issues in Fusion Reactor Design and Alternative Concepts



## Dr. Hamid Shahani

- President, Norax Canada, Saint-Romuald, QC.
- PhD. (1984) – Materials Science, RIT, Stockholm, Sweden.
- Post-doctoral Fellow, Queen's University.
- Sandvik Coromant Coating Technology (1988).
- Experience with plasma sources (DC magnetron, RF, Microwave magnetron, etc.)
- Started Norax in 1991 - power electronics (induction, RF, DC power supplies, etc.)







# Development of Standards in Fusion Reactor Technology



## Richard W. Barnes

- President and Principal Engineer at ANRIC Enterprises Inc.
- 32 years involved in the development of the ASME and CSA Codes and Standards.
- Vice Chair of the Technical Oversight Management Committee, past Chair and member of the BPV III Standards Committee of the ASME Boiler and Pressure Vessel Code.
- Member of the CSA B51 Technical Committee and President of the Canadian Boiler Society.





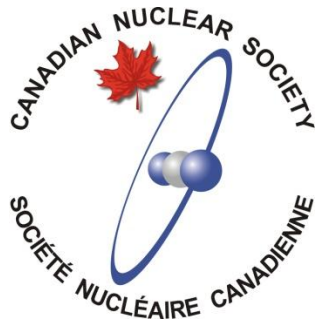
# Tritium Handling Technologies



## Dr. Hugh Boniface

- Senior Scientist, Section Head, Hydrogen Isotopes Technology Branch, AECL, Chalk River Laboratories (CRL)
- 1984-now, R&D professional at AECL-CRL, focusing initially on heavy water production technology, modelling and plant design, then moving to include related work on tritium processing technology.





# Fusion Neutronics Issues and Developments



## Dr. Andrew Davis

- Working at the University of Wisconsin-Madison on computational problems associated with fusion neutronics, specifically on the development of tools to better perform nuclear analysis.
- A physicist, previously with the United Kingdom Atomic Energy Authority at the Culham Centre for Fusion Energy, where he worked on fusion neutronics analysis for ITER and performed development related to neutron transport.





# CWFEST-2013

## Organizing Committee

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- **Professor Hossam Gaber, UOIT**
- **Dr. Blair P. Bromley (AECL- CRL), Chair, CNS-FSTD**
- **Mr. Raymond Mutiger, UOIT, CNS-UOIT Chair**
- **Mr. Terry Price, UOIT**
- **Mr. Gabriel Aversano, UOIT**
- **Many thanks to all un-named volunteers and assistants.**
- **Thanks to the IEEE and the CNS.**
- **Thanks to UOIT and FESNS.**
- **Thanks to Speakers, Attendees, and their supporting organizations.**



# CWFEST-2013

## Schedule



- 
- **9:00** Opening message from Dr. Blair P. Bromley  
— **Co-Chair CWFEST-2013**
  - **9:05** Opening message from Dr. Hossam A. Gabbar  
— **Co-Chair CWFEST-2013**
  - **9:10** – Welcoming message from Dr. Brent Lewis  
— **Dean of FESNS**
  - **9:15** – Message from MPP Donna Cansfield
  - **9:25** – Program announcement by Dr. Blair P. Bromley
  - **9:30** – Program start



# CWFEST-2013

## Opening Remarks



- **Self-Introduction.**
- **Thanks to you for coming.**
- **Thanks to all speakers, volunteers, UOIT/CNS/IEEE.**
- **Goal: Bring Fusion People Together in Canada**
  - **Researchers, educators, students, enthusiasts.**
  - **Entrepreneurs, industrialists, investors, etc.**
  - **Vendors, manufacturers, utilities.**
  - **Encourage communication and future cooperation and collaboration. Move Fusion into the Mainstream.**
- **First CWFEST. Hope to hold it again.**
- **Busy day, many interesting presentations.**
- **Pass along to Professor Hossam Gaber.**



# More Announcements



- **Help yourself to leftover refreshments.**
- **4 Presentations in morning**
  - **Please reserve questions until end of presentation.**
- **Panel discussion.**
  - **Informal questions and discussions. We will moderate.**
- **Lunch: 12:15-1:00 pm - Eat/Mingle/Network**
- **5 Presentations in afternoon.**
- **Coffee/Washroom Break: ~3:30 – 3:45**
- **Afternoon panel discussion: ~3:45 to 4:15 pm**
  - **Or a bit longer, if necessary.**
- **Group photos at end of day.**
- **Please pick up copy of Flyer for PBNC 2014.**



# PBNC-2014



- The Canadian Nuclear Society (CNS), the Canadian Nuclear Association (CNA) and Natural Resources Canada (NRCan) are proud to host the 19th **Pacific Basin Nuclear Conference (PBNC-2014)** in Vancouver, Canada, on August 24-28, 2014.



- For more information, see:
  - <http://pbnc2014.org/>
- Deadlines:
  - **Abstract: Sept. 30, 2013, Draft Paper Feb. 28, 2014.**





## Safety and Security



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- **We are in Room JW 201 – UOIT – North Campus**  
– **2000 Simcoe Street North Oshawa, Ontario, L1H 7K4**
  - **Washrooms.**
  - **Who knows First Aid?**
  - **Escape Route for Fire – Where to Meet.**
  - **Emergency Telephones.**
  - ***Traffic Safety – No Hurry – No Worry.***  
– ***Avoid distractions – Cell Phones / Texting.***