



# The CORS Bulletin

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## In This Issue

Hello everyone,  
In this Fall issue, we have some preliminary information on the CORS/MOPG 2012 conference. Please visit <http://web2.uwindsor.ca/cors-mopgp2012/cors2012.htm> for more information. Aside from the usual contributions, we have an announcement on the creation of the Special Interest Group (SIGs), Student Paper Competition updates from Fredrik Odegaard, CORS Education Chair, Call for Nominations for both the 2012 CORS Award of Merit and the 2012 CORS Service Award and information on the 2012 CORS Practice Prize.

We have sectional news from the Toronto and Waterloo Student Chapters as well as from the Saskatoon, Calgary and Edmonton chapters. We also have an OR@Work article from Professor Dave Martell, Forest Fire Management Systems, Faculty of Forestry, University of Toronto. Since we did not have a practice prize award this year, we sought out Dave to submit a report on his summer activities as a real-life, practical example of OR@Work. He was kind enough to oblige. In this article, he describes the time he spent with the Ontario forest fire incident management team and what he observed and learnt from them and how that has been successfully incorporated in this teaching and research program.

We are having a great response from our membership in terms of contributions. Please keep them coming. Thank you,

Chirag Surti  
Editor

### Editor

Chirag Surti

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# THE 2011 - 2012 COUNCIL

CORS Council is made up of the Officers of the Society, four Councillors, the Immediate Past President, a representative designated by each local section of the Society, and the Standing Committee Chairs. Contact information for 2011-2012 Council representatives is provided below. For a complete listing go to [www.cors.ca](http://www.cors.ca).

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Councillor	Douglas Woolford, Wilfrid Laurier University, <a href="mailto:dwoolford@wlu.ca">dwoolford@wlu.ca</a>
Councillor	Louis-Martin Rousseau, École Polytechnique de Montréal, <a href="mailto:louis-martin.rousseau@polymtl.ca">louis-martin.rousseau@polymtl.ca</a>
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Montreal	Louis-Martin Rousseau, École Polytechnique de Montréal, <a href="mailto:louis-martin.rousseau@polymtl.ca">louis-martin.rousseau@polymtl.ca</a>
Ottawa	Dragos Calitoiu, Bank of America, Ottawa, <a href="mailto:calitoiu@optimod.ca">calitoiu@optimod.ca</a>
Kingston	Jeffrey I. McGill, Queen's University, <a href="mailto:jmcgill@business.queensu.ca">jmcgill@business.queensu.ca</a>
Toronto	Joseph Milner, University of Toronto, <a href="mailto:milner@rotman.utoronto.ca">milner@rotman.utoronto.ca</a>
SW Ontario	Matt Davison, University of Western Ontario, <a href="mailto:mdavison@uwo.ca">mdavison@uwo.ca</a>
Winnipeg	Currently vacant
Saskatoon	Winfried Grassmann, University of Saskatchewan, <a href="mailto:grassman@cs.usask.ca">grassman@cs.usask.ca</a>
Calgary	Chandandeep Grewal, University of Calgary, <a href="mailto:csgrewal@ucalgary.ca">csgrewal@ucalgary.ca</a>
Edmonton	Armann Ingolfsson, University of Alberta, <a href="mailto:armann.ingolfsson@ualberta.ca">armann.ingolfsson@ualberta.ca</a>
Vancouver	Taraneh Sowlati, University of British Columbia, <a href="mailto:taraneh.sowlati@ubc.ca">taraneh.sowlati@ubc.ca</a>
Toronto Student	Jonathan Y. Li, University of Toronto, <a href="mailto:jli@mie.utoronto.ca">jli@mie.utoronto.ca</a>
Waterloo Student	Tiffany Matuk, University of Waterloo, <a href="mailto:tamatuk@uwaterloo.ca">tamatuk@uwaterloo.ca</a>

## PRESIDENT'S MESSAGE

Dear fellow CORS members,

I hope you are all enjoying the fall term. I will be reporting on Council activities since the last AGM: the fee increase, the formation of the first Special Interest Group (SIG), the changes to the CORS student paper competition, the CORS membership services position, the constitution, and the upcoming annual conference in Niagara Falls.

It feels like yesterday that we were in St. John's enjoying a well organized conference that contributed about \$13K to the CORS budget. The Council had its first meeting as the conference was wrapping up. We planned our meetings for the year, staffed our standing and ad hoc committees, expressed our greatest appreciation to the conference organizers for the work done, and thanked outgoing council members Vinh Quan and Corinne McDonald.



Samir Elhedhli

We agreed on having a single face-to-face meeting in Toronto in January 2012. We made changes to the Program Committee to assure continuity, and created two ad-hoc committees, one for the Constitution and the other for Special Interest Groups. Then, the majority of us headed to the airport. I made sure to hold tightly to the silver jubilee of the CORS president and rehearsed my answers in case I get asked about it, which did happen. I had to go over the history of the cup and the society a couple of times. The response, I often got, was "... so, you did not win it, it got handed over to you !!!".

Once back, the first matter to attend to was to seek a vote on the proposed fee increase. Although the ballot turnout was only 36.34%, the vote was about 80% in favour of the new fee structure. I would like to thank the members who have responded, whether in favour or against, for caring about the Society. This will certainly help CORS face the financial challenges that lie ahead. The second matter was to finalize the SIG policy. Once this was in place, the queuing group was ready to make history. They formed the first SIG with 26 CORS members and 11 promising to become CORS and SIG members in the near future. Obviously, the SIG is achieving its goal of bringing members back to CORS. The Council and I are looking forward to the formation of the next SIG.

In September 30, 2011, the Council had its second meeting via teleconference. Besides going through business as usual which included updates on finances, conferences, publications, etc. The Education Chair, Fredrik Odegaard, proposed a number of changes to the CORS Student Paper Competition, which included announcing the winner at the CORS banquet, providing a cash prize, finding a sponsor, and possibly naming the award after an OR pioneer. The proposal will certainly increase the visibility of CORS.

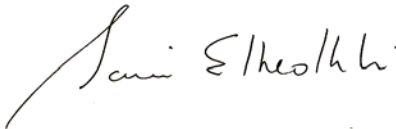
The third urgent matter the council was busy with is to prepare for the vacancy of the CORS membership services position. After many years of great service, Wendy Caron is stepping down. I take this opportunity to once again thank her for the many years of outstanding service.

Thank you Wendy and keep in touch. A call for applications has been sent out through the listserv. I hope to be able to welcome the new person in my next message.

Just as I am writing this message, Vinh Quan the head of the newly established Constitution ad hoc committee, emailed with updates. The Canada Not-for-profit Corporations Act (NFP Act) came into force on October 17, 2011. This will make it possible to finalize the constitution before the next AGM.

Over the past month and a half, Elkafi Hassini and I were busy planning for the upcoming annual conference in Niagara Falls. The web page is up and running with most of the key items in place. The program features the Harold Larnder Memorial Lecture by George Nemhauser. Fourteen clusters are confirmed so far, displaying a mosaic of the diverse research interests of our members.

Till the next message, I wish you all a happy holiday season, and do not forget to **come join us for**



Samir Elhedhli  
CORS President

## Fall Greetings from the CORS Education Chair

Dear Colleagues and Friends,

As the academic fall-term approaches its zenith and the end-of-term starts creeping up on us, I want to remind everyone about the CORS education programs.

### Student Paper Competitions

I hope everyone is aware of the two student paper competitions that CORS host in conjunction with the annual conference. There are two categories - Open (graduate) and Undergraduate. I encourage everyone who teaches or supervises students to consider submitting their best student work. I would also like to point out that the purpose of the student paper competitions is to give recognition and celebrate the great work done by our students. That is, the competitions are not intended to require additional work or effort. Therefore, for those of you who teach undergraduate courses with projects consider having the report be such that it may be submitted without further work. Similarly to those of you supervising graduate students, consider having your student write their paper such that it can be submitted without any additional editing.

### CORS Diploma

CORS in association with participating Canadian universities awards a Diploma to students completing a program of study with significant exposure to operational research. For more information regarding the requirements and a list of the current participating universities visit the CORS website. If your school is not listed and you would like it to be, simply send me an email. I would also like to ask all of you who currently are teaching OR related courses to inform your students about the CORS Diploma. A simple announcement that they may be eligible for the CORS Diploma and to visit the CORS website (<http://www.cors.ca/en/students/index.php>) for more information would be much appreciated.

### Conference Support

CORS has two student designated conference support programs. The Graduate Student Conference Support (GSCS) program provides partial financial support for CORS student members to attend events specifically aimed at graduate students, e.g. student conferences, doctoral colloquia, and conferences for junior operations researchers. In addition, CORS through support from SSHERC provides partial funding for students to attend the CORS annual conference.

### Education Cluster at CORS Annual Conference

Usually at the CORS annual meetings there are a couple of sessions which focus on Education and Students. Next year at Niagara Falls will be no different and if you would like to give a talk in an Education based session feel free to contact next year's Education Cluster Chair - Srinivas Krishnamoorthy ([skrishnamoorthy@ivey.uwo.ca](mailto:skrishnamoorthy@ivey.uwo.ca)) - or myself.

The above descriptions have on purpose been left short and I hope you will visit the CORS website to find out more. If you have any questions, comments or suggestions related to CORS and Education feel free to email me. I wish you all a very productive and enjoyable fall.

Best regards,  
Fredrik Odegaard  
CORS Education Chair  
[fodegaard@ivey.uwo.ca](mailto:fodegaard@ivey.uwo.ca)

# ANNOUNCEMENTS

## CORS Special Interest Groups

Building on the enthusiasm displayed by those who attended the Special Interest Groups Meeting at the CORS 2011 Annual Conference in St. John's, CORS Council recently approved a policy on Special Interest Groups (SIGs). A SIG provides a mechanism to promote CORS, the SIG area and the SIG members, as well as the opportunity for CORS members with common interests to interact and network.

CORS Council is happy to announce the formation of the first CORS SIG: A petition to form a CORS Queueing Theory SIG, with Professor Doug Down ([downd@univmail.cis.mcmaster.ca](mailto:downd@univmail.cis.mcmaster.ca), McMaster University, Department of Computing and Software) acting as the inaugural President, has been approved. Thanks to Doug Down for being willing to act as president of this SIG and to all CORS members who signed the petition. Thanks also to Past President Armann Ingolfsson, who spearheaded the SIGs initiative. Please contact Prof. Down if you would like to join the Queueing Theory SIG, or indicate that you would like to join when you renew your CORS membership.

CORS encourages members with common interest in an area within or related to operational research to form additional SIGs. More information about SIGs can be found online at <http://www.cors.ca/en/membership/index.php>.

Discussions are already underway about forming SIGs in several areas.

If you are interested in forming a SIG in a particular area then feel free to contact the CORS SIG Committee.

CORS SIG Committee: Armann Ingolfsson ([Armann.ingolfsson@ualberta.ca](mailto:Armann.ingolfsson@ualberta.ca)), Samir Elhedhli ([elhedhli@uwaterloo.ca](mailto:elhedhli@uwaterloo.ca)), and Douglas Woolford ([dwoolford@wlu.ca](mailto:dwoolford@wlu.ca)).

# CALL FOR NOMINATIONS

## 2012 CORS Award of Merit

Nominations are invited for the 2012 CORS Award of Merit. This award acknowledges significant contributions of a present or past member of CORS to the profession of Operational Research.

Significant contributions can include:

- being specially recognized as an operational research practitioner,
- the development of a methodology relevant to the use of operational research,
- the supervision and development of operational research competence in others,
- the promotion of operational research in Canada through talks, presentations, articles, books, or by other means,
- service to CORS at either the national or local level.

Please submit nominations before January 13, 2012 to:

Armann Ingolfsson  
Associate Professor & CORS Past President  
School of Business  
University of Alberta  
Edmonton AB T6G 2R6  
Phone: 780-492-7982  
email: [armann.ingolfsson@ualberta.ca](mailto:armann.ingolfsson@ualberta.ca)

## CORS 2012 Service Award

If you know of anyone who has dedicated their time to CORS and who has a longstanding service record, please consider nominating him or her for the CORS Service Award. CORS National Council urges all local sections to consider and nominate its best candidates.

Nominations, including the candidate's name, activities, positions, and years of service should be sent to Elkafi Hassini, Vice-President of CORS, before March 1, 2012. The nominating committee will evaluate the submissions and bring three to four names forward to Council for approval. Evaluations use the point system shown below for guidance in assessing CORS-related activities. Previous winners are not eligible for additional service awards. A list of past CORS Service Award recipients may be found at: [http://www.cors.ca/en/prizes/i\\_service.php](http://www.cors.ca/en/prizes/i_service.php).

The point system is provided on the next page. As a guideline, winners should have 2000 or more points.

For further information or to submit a nomination, please contact:

Elkafi Hassini  
McMaster University  
E-mail: [hassini@mcmaster.ca](mailto:hassini@mcmaster.ca)



## Service Award Point System

Responsibility	Point Value
<b>CORS Council</b>	
President	500
Vice-President	350
Secretary	300
Treasurer	300
Councillor	250
Appointed	200
Past President	150
<b>International Conference /</b>	
Conference Chair	350
Committee Chair	300
Committee Member	200
<b>National Conference</b>	
Conference Chair	300
Committee Chair	250
Committee Member	200
<b>Publications</b>	
Bulletin Editor	350
INFOR Editor	350
Special Editions	150
Others	200
<b>Local Council</b>	
President	350
Vice-President	250
Secretary	200
Treasurer	200
Others	150
Past President	100
<b>Miscellaneous</b>	
IFORS Executive	250

## CORS/MOPGP 2012: Latest News from Conference Organizers

- In addition to the wondrous location on the beautiful Niagara Falls, plans are under way to have an exciting scientific and social program.
- Visit <http://www.cors.ca/cors2012> for the latest updates on the conference. You will find there a list of cluster chairs. Please contact Samir Elhedhli, Program Chair, [elhedhli@uwaterloo.ca](mailto:elhedhli@uwaterloo.ca), if you would like to chair a new cluster. If you would like to form a session on a certain topic please contact the suitable cluster chair. If you just want to submit your own abstract please consult the speakers instructions here: <http://www.crt.umontreal.ca/scro/directives.php>.
- This year we will have special journal issues with the conference. More details will be made available here: <http://web2.uwindsor.ca/cors-mopgp2012/Sepcialissues.htm>.
- The conference will be held at the Sheraton on the Falls hotel. A limited number of rooms has been reserved in the Sheraton on the Falls with the following rates:

City View: \$139.00

Fallsview: \$179.00

Please call the hotel directly at 1-800-519-9911 and request the special convention rate for the Canadian Operational Research Society.

**Cut off Date: May 10, 2012**

Check-in Time 3:00 pm

Check-out Time: 11:00 am



## 2012 CORS Practice Prize Competition

Each year the Canadian Operational Research Society conducts a competition on the practice of OR at its annual conference. There are two basic purposes behind the Competition, the first being the obvious one of recognizing outstanding OR practice. The other is to focus attention on OR and its applications by practitioners from Canada by attracting quality papers to the CORS National Conference. Entries are expected to report on a completed, practical application, and must describe results that had a significant, verifiable and preferably quantifiable impact on the performance of the client organization.

### **Award:**

Up to a maximum of \$1800 in prize money may be awarded by the committee: however, the committee reserves the right not to award any prize. Prizes (First, Second, Third/Honourable Mention) are awarded at the discretion of the Committee. Every team member receives a certificate.

### **Eligibility:**

Work on the submitted project may have taken place over a period of several years, but at least some of the work must have taken place over the last two years. Previous publication of the work does not disqualify it; however, you may not report on a project which has been previously submitted to the CORS Competition on the Practice of OR. The submitter/author must be a resident of Canada.

### **Requirements of Finalists:**

Finalists must submit a detailed written report not exceeding 25 pages in the body and make an oral presentation of the paper at the CORS Annual Conference. They are also required to prepare a one page project summary, suitable for publication in the CORS Bulletin and on the CORS website, detailing their project and its impact on the client organization.

### **How to Enter the Competition:**

To enter this year's competition, one or more of the authors is to submit an application before **March 19, 2012** to:

Rick Caron  
Department of Mathematics and Statistics  
University of Windsor  
Windsor, ON N9B 3P4  
Phone: (519) 253-3000 (3043)  
E-mail: [rcaron@uwindsor.ca](mailto:rcaron@uwindsor.ca)

A complete entry will include:

1. An abstract both by e-mail and in hardcopy, not exceeding 500 words of a paper on an actual success story of OR.
2. A letter by an executive of the client organization that sponsored the application, attesting that this application truly had an impact and that the organization would not object to having a paper presented.
3. The phone number of the author(s) and the name(s), title(s) and phone number(s) of at least one executive of the client organization where the OR application was put into effect.

**Selection Criteria:**

The main criteria considered in evaluating submissions are:

1. The project, which should exemplify the challenging application of the operational research approach to the solution of significant applied problems.
2. The quality of the analysis, of the modeling and of the successful implementation of the results at the client organization.
3. The significance of the impact of the results and recommendations on the performance of the client organization.
4. The presentation, both written and oral. A crucial part of the presentation is a "case history" of the project, which describes the project's development from start to finish, and focuses upon the challenges faced by the analysts.

**Important Dates/Deadlines:**

Applications must be received by **March 19, 2012**.

Finalists will be selected by **April 9, 2012**.

Finalists must submit a detailed written report by **April 30, 2012**.

Finalists must make an oral presentation of the paper at the CORS Annual Conference in Niagara Falls, ON **June 11-13, 2012**.

For more information, please contact the Practice Prize Committee Chair:

Rick Caron  
University of Windsor  
E-mail: [rcaron@uwindsor.ca](mailto:rcaron@uwindsor.ca)

# CORS SECTIONS NEWS

## Calgary

On Thursday, November 17, 2011 the Calgary Section will hold a Professional Development Seminar. The topic of the presentation given by Chandandeep Singh Grewal, University of Calgary will be *Robustness Measurement of Supply Chain Replenishment Strategies under Multiple Performance Measures*.

**Abstract:**

Supply chain practitioners are becoming increasingly aware of the necessity of protecting against uncertainty. The degree of protection against the effects of variability and uncertainty is partially a function of the robustness of the replenishment strategy. Robustness relates to the sensitivity of performance to changes in the replenishment environment.

This talk will present robustness measurement of supply chain replenishment strategies when there are two interacting performance measures. This will discuss a new robustness measurement methodology based on trade-off curves. A proposed robustness index, based on area under the trade-off curves, is further used to evaluate the performance of Kanban and reorder point replenishment strategies. An optimum-seeking simulation approach is used to set base conditions prior to perturbing the environment. Changes in the replenishment environment include transit time variability, transporter frequency, demand levels and the duration of manufacturing disruptions.

**About the Speaker:**

Chandandeep is currently working as a Supply Chain Performance Analyst at SMART Technologies, Calgary. He is also currently finishing his PhD at the University of Calgary. He was also involved in different supply chain and quality management projects in India. He received his Master of Technology in Industrial Engineering from the Indian Institute of Technology, Delhi (India). His areas of interest are supply chain management, operations management, simulation modeling and lean systems. He is a member of the Institute of Industrial Engineers (IIE), the Canadian Operational Research Society (CORS), the Indian Society of Mechanical Engineers (ISME), and the Indian Society for Technical Education (ISTE).

## Edmonton

On Thursday, October 27, 2011 the CORS Edmonton section hosted a Dinner/Speaker session featuring David Staples of the Edmonton Journal speaking about "Hockey Analytics: How Hall-of-Fame coach Roger Neilson revolutionized the use of statistics to evaluate players."

## Saskatoon

On November 17, 2011 CORS Saskatoon will welcome Sherry Weaver, Haskayne School of Business, University of Calgary to give a talk entitled *Can Joint Replacement be Like a Trip to Disneyland?* Please go to <http://www.cs.usask.ca/cors/111117.html> for more details.

**Abstract:**

Over the last decade, hip and knee replacements have doubled, resulting in median waits of 42-206 days. The Canadian Orthopaedic Association endorses 3 urgency-based access targets, leading to our research problem: How can we schedule patients of varying urgencies, several months into the future, while accounting for variability in operating room time and surgeon

availability? How can we minimize the 'bumping' of patients as certainty is increased closer to the date of surgery? Lessons learned from the magical kingdom can be applied to healthcare!

How many surgical spots should be dedicated to urgent patients in order to ensure that these patients all receive timely care while minimizing the disruption to less urgent patients? How can queueing theory and discrete event simulation be used to improve patient care? The results using actual clinical data from a high-volume surgical clinic will be discussed as well as our ability to impact actual clinical practice with our models.

## Toronto Student

The CORS Toronto Student Chapter has been supporting the development of a new OR group at the University of Toronto called the University of Toronto Operations Research Group (UTORG). UTORG is a student-run organization located in and also supported by the Mechanical and Industrial Engineering Department at UofT, which has an active research group in Operations Research and a high level of interest to stimulate OR discussion with other communities at UofT.

UTORG serves the interests of the OR community at UofT and provide a means of communication among students, researchers and practitioners interested in OR. Last year, the University of Toronto Operations Research Group (UTORG) and the CORS Toronto Student Chapter have invited speakers from both academic and industry to give seminars on the topics of financial optimization, health-care optimization, academic OR-related job searching, among others. UTORG has also held numerous local OR seminars and presentations, where students can meet and informally discuss topics in OR and learn directly from "student-specialists" in current areas of OR. UTORG has grown to over 150 members over the last year including students and faculty members at UofT from the Mathematics, Business (Rotman) and Computer Science department, among others.

All upcoming featured seminars and events will be scheduled over the coming few months. Details of all our events and distinguished speakers can be found on our official website at: <http://org.mie.utoronto.ca/>. UTORG welcomes all CORS members to attend, participate and present over the coming year. To become a member, you can register with the group on the official website. UTORG also has a open and friendly members-forum on Facebook. Please join UTORG's Facebook group at: <http://www.facebook.com/groups/utorg/>.

Jonathan Y. Li, Ph.D. Candidate,  
Department of Mechanical and Industrial Engineering,  
University of Toronto  
[jli@mie.utoronto.ca](mailto:jli@mie.utoronto.ca)  
CORS Toronto Student: [http://www.cors.ca/documents/TO\\_Student\\_May192010.htm](http://www.cors.ca/documents/TO_Student_May192010.htm)

## Waterloo Student

In August 2011 the Waterloo Student section elected a new executive. The new executive of the Section is:

President: Tiffany Matuk, [tamatuk@uwaterloo.ca](mailto:tamatuk@uwaterloo.ca)

Treasurer: Daniel Bayer, [dbayer@uwaterloo.ca](mailto:dbayer@uwaterloo.ca)

Past President: Bissan Ghaddar, [bghaddar@uwaterloo.ca](mailto:bghaddar@uwaterloo.ca)

## CORS MEMBERS MAKING WAVES

Suresh P. Sethi is currently President Elect of the Production and Operations Management Society (POMS) and he will become President of the society at the POMS conference in 2012. Prof. Sethi is Eugene McDermott Chair of Operations Management and Director of the Center for Intelligent Supply Networks at The University of Texas at Dallas. He has written 7 books and published nearly 400 research papers in the fields of manufacturing and operations management, finance and economics, marketing, and optimization theory. He teaches a course on optimal control theory/applications and organizes a seminar series on operations management topics. He initiated and developed the doctoral programs in operations management at both University of Texas at Dallas and University of Toronto. He serves on the editorial boards of several journals including Production and Operations Management and SIAM Journal on Control and Optimization. He was named a Fellow of The Royal Society of Canada in 1994. Two conferences were organized and two books edited in his honour in 2005-6. Other honours include: IEEE Fellow (2001), INFORMS Fellow (2003), AAAS Fellow (2003), POMS Fellow (2005), IITB Distinguished Alum (2008), SIAM Fellow (2009), POMS President Elect (2011).

## OR@WORK

### **Wandering around the plants: Why I spent two summers on an Ontario forest fire incident management team**

*By  
David Martell  
Faculty of Forestry  
University of Toronto*

I spent my childhood in northern Ontario and northern Quebec where forests fires are common but I first became interested in forest fire management in 1970 when, as an undergraduate Industrial Engineering (IE) student at the University of Toronto, I secured a summer job working in the Forest Fire Control Unit (FCU) of the then Ontario Department of Lands and Forests in Toronto. My job was to assist one of FCU's planners with the development of a simulation model that could be used to help evaluate airtanker performance. Early that summer the department's research and development specialist took me and another researcher from the Forest Fire Research Institute in Ottawa on a one week study tour across the province to visit fire headquarters and meet with fire managers to help us develop an understanding of forest fire management and Ontario's fire research needs. Early in the trip we stopped at the Petawawa Forest Experiment Station near Chalk River where we met with fire behaviour researchers. During the afternoon coffee break while we were sitting outside the cafeteria, one of our hosts noticed smoke in the distance. He suggested we drive over to investigate and grabbed a stopwatch and a surveyor's chain before we left the station. We soon arrived at what proved to be a small grass fire that was being successfully fought by the local municipal fire department. I stood off to the side and observed the fire while one of the fire behaviour researchers used his chain and stop watch to measure the fire's rate of spread. My first reaction was, "this is cool".

The following day we resumed our cross-province trip during which we stopped at many local headquarters where we met with fire managers that described what they were doing and their challenges and patiently responded to our often somewhat naïve questions. I spent the rest of that summer in the FCU in Toronto where I assisted with the development of the airtanker simulation model. I returned to school that Fall and completed a fourth year thesis project that built on my summer experience. My summer experience coupled with the fact that the staff of the FCU took time to help me understand fire operations and satisfy my many requests for data made it clear to me that fire managers had interesting decision-making problems, some of which were amenable to Operational Research (OR) methods and that they were very eager to collaborate with researchers. I subsequently completed Masters and PhD programs in IE at the University of Toronto during which I applied OR to other forest fire management problems.

As I neared completion of my PhD program the Faculty of Forestry at the University of Toronto advertised a forest fire specialist position. I applied for and was offered an appointment despite the fact that I had completed only one Forestry course (Natural Resource Economics) while I was an IE graduate student. I soon learned that the Faculty of Forestry was a multi-disciplinary community that welcomed specialists from many disciplines but as I taught my first undergraduate course in forest fire science I quickly realized that I needed to learn much more about fire operations than I had learned as a summer student and in the course of completing my three IE thesis research projects. I spoke with my contacts in the FCU in Toronto and asked if it might be possible for me to spend a portion of the next fire season on a fire crew. Word



filtered out through the department's fire program and the fire control supervisor in Thunder Bay district agreed to hire and assign me to one of their five-person unit fire crews based at Shebandowan, just west of Thunder Bay. The senior crew leader who also served as the base manager accepted me on his crew where I worked for about six weeks during which I was trained and helped fight fires in Thunder Bay district and travelled with my crew, to help fight fires in Kenora and Sioux Lookout districts. That the Shebandowan base manager and others were so willing to help an academic acquire some practical experience on the fire line proved to be but one of very many clear indications that Ontario's fire managers were, and remain, exceptionally supportive of research and development and of researchers.

During subsequent years the Ontario Department of Lands and Forests became the Ontario Ministry of Natural Resources (OMNR) and from time to time, I was invited to present my research findings at their training courses and technical meetings during which I also informally quizzed fire managers and encouraged them to describe their decision-making problems. I spent parts of several summers with a Canadian Forest Service fire behaviour researcher and his field crew as they set up experimental burning plots that were ignited and controlled by OMNR fire crews which provided an opportunity to observe fire behaviour close-up as the plots burned. When it became hot, dry and windy and burning conditions became extreme the experimental burning program was shut down. I then travelled with that researcher to large forest fires in other parts of Ontario and saw how he both compiled empirical fire behaviour data from wildfires and shared his knowledge of fire behaviour with fire managers. I also learned there were interesting decision-making problems associated with large fire operations. I was made to feel welcome in fire camps and was encouraged to sit in on both formal and informal planning sessions where I learned about decision-making and fire management research needs.

I gradually learned how to imbed myself in fire operations and for many years visited district and regional fire centres and prescribed fire and wildfire suppression operations where I continued to further my understanding of fire and fire operations. Over time other academic commitments reduced my ability to spend time in the field and I gradually came to realize that new knowledge, technology and administrative systems of which I was unfamiliar were being brought to bear on large fire operations. During the 2005 fire season I was fortunate to have had an opportunity to visit two large fires in Ontario but it was becoming increasingly difficult for me to "drop in" on fire operations as fire activity decreased in Ontario and Ontario's fire managers were spending more and more time managing fires in other parts of Canada and the United States.

This problem came to a head when the leader of a team of OMNR fire managers that was dispatched to another province agreed to have me visit his operation there but I was not able to obtain the permission of the local agency to do so on short notice as they were dealing with a large number of challenging fires and quite understandably, did not have time to respond to requests from an academic that wanted to "drop in" on and observe their operations. I was becoming increasingly ignorant of what was going on in the field and discussed my concern with the research and development liaison person in Ontario's fire program. His suggestion was that I be assigned as a researcher, to one of Ontario's Incident Management Teams (IMTs).

### **Incident Command System**

The Incident Command System (ICS) was developed under the FIRESCOPE project which was led by the US Forest Service in response to what happened in 1970 when "a continuing siege of

major wildfires over the chaparral region of southern California severely taxed the capabilities of the region's fire protection agencies and caused major damage to structures and wildland resources" (Chase 1980). It, in the words of its developers, "probably represents the first practical application of systems design to a major, complex wildland fire management operational problem" (Chase 1980). ICS has since evolved and been adopted by most North American forest and wildland fire management agencies and many other emergency response organizations (see for example, <http://www.fema.gov/emergency/nims/IncidentCommandSystem.shtm>). ICS allows for a scalable organizational structure that can be small for relatively simple Type 5 incidents that are managed by small numbers of individuals up to large complex Type 1 incidents that may be staffed by hundreds of people and managed by more experienced Type 1 IMTs. A Type 1 IMT is led by an Incident Commander (IC) and includes Operations, Planning, Logistics and Finance & Administration sections.

### **How I got assigned to an IMT?**

As was the case in 1976, word filtered out through the OMNR's IMT system – I would like to be assigned to an IMT for the 2010 fire season – were there any takers? Fortunately for me, there was and I was assigned to one of the OMNR's IMTs as a researcher, to report to the Plans Chief who was familiar with some of the research my students and I had carried out in collaboration with the OMNR in the past. Since I am neither qualified nor certified to fill any of the positions on an IMT I was neither expected or called upon to participate in the planning – my role was simply to observe what was going on to achieve my research objectives.

I first had to fulfill some formal training requirements to familiarize myself with the ICS, some basic health and safety training and the OMNR's fire management policies and procedures. I sat in on pre-season provincial briefing of representatives of all four of Ontario's IMTs and I participated in the annual pre-season briefing of the full IMT to which I was assigned. I then had to determine how I could pack all of my clothing, camping equipment and other equipment including my GPS, camera and laptop computer, in a two part pack that could not, under any circumstances, exceed 65 pounds in weight. I spent a lot of time weighing socks, underwear, shirts and other clothing items and comparing the relative merits of the many items I would like to take with each other and the value of having a camera and a laptop computer. Suffice it to say that my academic training in multi-criteria decision-making modelling and the classical knapsack problem were of no help whatsoever.

Then the waiting began. Ontario has 4 IMTs and they rotate through a roster system. If a type I IMT is needed in Ontario or elsewhere in Canada or the United States the IMT at the top of the list is assigned to that incident (fire). Assignments can last for up to 19 days with up to 14 days on the fire itself. My team rotated through the roster during what proved to be another quiet fire season in Ontario but late in August, just as I was losing hope of being assigned to a fire, we were assigned to a fire in British Columbia. I flew to Thunder Bay where I joined the other members of the team. We flew to Kamloops British Columbia where we were briefed on the overall fire situation and British Columbia's policies and procedures. The next day we travelled to the local headquarters where we were briefed in more detail about the fire to which we had been assigned and then travelled to the fire itself to begin the formal transition from the team that had been responsible for the fire to our team. This was to be home for the next two weeks.

## Modus Operandi

My modus operandi is to wander around fire operations and “hang out” or be a “fly on the wall”, somewhat akin to what social scientists refer to as participant observation or a researcher’s

variant of what some management writers call Management by Wandering About (MBWA) (see for example, Anonymous 2008 or Imai 1997). I take care to re-assure those involved that 1) I am not a consultant that was contracted to assess them or their performance; 2) I am not employed by or paid by the OMNR; 3) I am not collecting data concerning or documenting the management of any particular fire; 4) I do not report back to senior management of the OMNR and 5) if and when I reveal what I learn in my research publications, presentations and in the course of my teaching, I will take care not to reveal precisely where and how I acquired that knowledge unless I want to credit a valuable contribution from someone who deserves and I thought would appreciate such recognition. My primary objective is to further my understanding of large fire management operations to inform my on-going research. My secondary objective is to enhance and update my knowledge and understanding of all aspects of forest fire management.

I was told that I was welcome to sit in on any and all the IMT’s formal and informal meetings and briefings. I took care not to interfere but later, when an opportunity arose, I would meet and discuss with individuals, some of what had transpired at such meetings. Fire managers don’t spend much time dallying over meals but one can learn a great deal during quick meals. Once the members of the IMT became comfortable with my presence they would occasionally pull me aside to show me something or discuss something they thought might be of interest to me. From time to time, for example, someone would tap me on the shoulder and say “are you busy this afternoon – I’m going to be doing/going to x and you’re welcome to come along”. One day, for example, one of the members of the IMT invited me to accompany him as he drove up to the fire to see first-hand, what was happening on part of the fire – his version of MBWA. That drive proved to be an ideal opportunity for me to learn not only about the fire to which we had been assigned but he also proved to be a willing captive whose graciously weathered a barrage of my questions on many fire-related topics. Another time I was invited to join another member of the IMT when he flew out to check several small fires in our complex and that gave me an opportunity to describe what type of research my students and I were carrying out and question him about his challenges and research needs.

One day I was asked if I could help out in Finance and Administration (Fin & Admin) section. They were short-staffed and needed someone who could quickly be trained to assist with simple clerical tasks and I fitted the bill. My job was to accept time sheets, check them and enter them into a database. I functioned in that clerical position for two and a half days during which I earned the respect of the members of the IMT who realized I was willing to help out when needed. Most importantly to me, I spent 2.5 days sitting in the Fin & Admin trailer to which all the supervisors brought their time sheets at the end of each day and I was able to “listen in” as they described what had happened out on the fire line that day. During that brief 2.5 day period I learned an enormous amount about the economics of fire management from the ground up, what type of data was available in what format, where it was located, and who to ask to gain access to such data for research purposes.

A detailed description of the many things I learned and the many research opportunities I identified in BC is beyond the scope of this article but some of the things I learned and gained

some appreciation of include:

1. The importance of inter-provincial resource sharing and how it takes place
2. The logistical challenges associated with supporting more than 500 people engaged in fighting a large fire
3. Fire behaviour on forested landscapes that have been heavily impacted by Mountain Pine Beetle
4. How fire is fought in relatively dry areas of BC
5. The impact of fire on residents of local communities

My BC assignment was a tremendous learning experience that enriched both my research and teaching and I returned home with a long list of research questions for me and my students to address but several members of my team suggested it would be good for me to also see how they operated in Ontario. My original plan was to spend only one summer on an IMT but prior to the 2011, the IC asked me if I wanted to remain with his team for another fire season and I leapt at the opportunity. Once again I packed my bags and waited and late in June our team was assigned to a fire complex (a cluster of fires) in northwestern Ontario and once again I spent two weeks on a steep learning curve that was, as had been suggested, quite different than the one I had been on in BC.

Late one afternoon an initial attack ranger crew was dispatched to a new fire near our fire complex. The fire was large, spreading rapidly and burning very intensely. It was clearly well beyond the capabilities of an initial attack force and late in the day, so the crew returned to base where the crew leader prepared a Fire Assessment Report (FAR) in which he documented the current status of the fire, its spread potential and the values it threatened and developed alternative strategies for managing that fire. The next morning another fire management technician (FMT) was assigned to update the status of the fire. I requested and was given permission to accompany him on his reconnaissance flight.

We flew up to the fire and I sat in the back of the aircraft and observed as he sketched the current fire perimeter, assessed the fuels and topography ahead of the fire so that he could later predict how far it might spread in the coming days. He then instructed the pilot to fly search patterns ahead of the fire during which he looked for cottages (which are referred to as camps in that area) and other values at risk. Just as we were about to return to base the sector response officer (SRO) informed him that another fire had been reported near a community some distance away. We were directed to fly to that fire so the FMT could assess its status and prepare a FAR for it as well.

We flew to that fire which was also large and burning intensely and visible from a long distance away. It was exhibiting a very intense form of fire behaviour I had never observed – the spawning of horizontal roll vortices that ignited jump fires parallel to but some distance from the flanks. Once again we flew the fire as the FMT sketched out the current perimeter and mapped fuels and topography ahead of the fire and then focused on finding and mapping the location of camps and other values at risk. We then returned to the first fire for a quick final assessment of its status then we returned to base where I sat and watched as he prepared the two FARS.

Later that day, after we had returned to the fire headquarters, I asked how difficult it would be to protect camps in advance of such fires. One of the other members of our IMT overheard our conversation and a few minutes later handed me a DVD that contained a PowerPoint

presentation that documented the use of sprinklers for value protection. His presentation contained very convincing pictorial evidence that the use of sprinklers for values protection (which I had seen set up in a small community near our main fire) is indeed a very safe and cost-effective strategy for protecting structures that might be over-run by large intense forest fires. During that day I; 1) had an opportunity to view first-hand, the formation of dangerous horizontal roll vortices on the flanks of a large intense fire, 2) how to carry out reconnaissance of a large uncontrolled fires, 3) how a FAR is prepared and 4) acquired very convincing evidence that sprinklers work are a cost-effective tool in some areas. Another day I had an opportunity to sit in the back of the Ignition Team Leader's helicopter and watch him direct a major burning-out operation in what proved to be a crash course on the use of fire to manage fire. It not only cleared up some of my mis-conceptions about how fire is used to manage fire but I learned how fire can be used to reduce suppression costs and introduced me to a whole new class of interesting decision-making problems that my students and I hope to pursue in the near future. Not bad for two days "work".

### **What have I learned and how has it benefited my teaching and research programs?**

A detailed description of the valuable knowledge I acquired during the 2010 and 2011 fire seasons is well beyond the scope of this article and would, I recognize, be of little interest to non-fire specialists. Suffice it to say that the knowledge I acquired has benefited both my teaching (I can share knowledge that is not normally available to students and develop challenging term-projects that are motivated by real-world problems) and my research (I identified challenging new problems, identified valuable sources of data, and met experienced fire specialists who agreed to share their knowledge and experience with me and my graduate students). Put in general terms, it made it possible for me to:

1. Acquire valuable insight into specific problems that my students and I are currently investigating (e.g., large fire management systems and airtanker operations)
2. Identify new challenging "real world" problems that are amenable to OR approaches
3. Meet individuals that my students and I can subsequently contact to clarify what really happens and from whom we can request pertinent data
4. Familiarize field staff with my research program and let them know they are welcome to contact me for assistance in seeking research solutions that I or others have developed.

### **What's the cost of trying to keep a foot in the field?**

When I was first appointed as a lecturer one of my senior colleagues (a forest soils specialist) gave me two important pieces of advice that have served me well throughout my career. His first suggestion was that I get out into the field and get some dirt (in my case, ash) on my boots. His other suggestion was that when I did venture out into the field, that I not ignore junior staff because they are often able to provide valuable information of which senior managers might not always be aware.

Field trips take time of course – time that could (some might say, better) be devoted to formulating and solving models and writing and submitting publications and research proposals. I was able to achieve what I considered to be an appropriate balance but the world has changed and one of my concerns is that new academic staff may not have enough time to do what I did as they are under intense pressure to publish papers and acquire research grants as quickly as they possibly can and "hit the ground running" (a somewhat ironic choice of words when you

reflect on its meaning). Most do not have an opportunity to wrap up their PhD dissertation research, find out what's really going on in the real world and acquire new knowledge that would serve as the foundation upon which they can build their research program.

I go to fires because it's essential that I understand fire behaviour, fire operations and fire management decision-making to accomplish my research and teaching objectives. But I would be dis-honest if I did not admit that I enjoy the adrenaline rush that comes from the sound of a fire pump, the roar of an airtanker taking off, the whine of helicopters powering up and lifting off for a fire, flying over a remote fire that poses no threat to people, property or forest resources and admiring Nature "do its thing" and later, walking portions of the burn to see firsthand, what the fire has done.

When I was a graduate student Gene Woolsey of the Colorado School of Mines emerged as a very strong and articulate (dare I say bombastic) advocate of the need for academics to connect with the real world (see Woolsey 2003). I was initially quite sceptical of his somewhat strident criticisms of academia but I soon recognized the importance of keeping in touch with what really goes on in the woods to inform both my teaching and my research. I have been very fortunate that throughout my career I was able to partner with a fire management organization that has always gone the extra mile to make it possible for me to do so.

### **Acknowledgements**

I thank Grahame Gordon, Rob McAlpine, Paul McBay, Susan Reany-Iskra and Dave Cleaveley of the Ontario Ministry of Natural Resources who made it possible for me to be assigned to one of Ontario's IMTs, as well as the many fire people I encountered in both Ontario and British Columbia who shared their valuable knowledge and expertise with me during the 2010 and 2011 fire seasons. Special thanks are due Dave Manol, the IC of the 2010 Manol IMT and Gary Harland, the IC of the 2011 Harland IMT that consented to having an academic from Toronto assigned as a researcher to their teams as well of course, to all the members of both of those teams that so warmly welcomed me into their midst and ensured I that learned as much as possible during the short time available.

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Photographs.

Figure 1. Sioux Lookout fire 35, 2011. Photo courtesy Mitch Miller, Ontario Ministry of Natural Resources.



Figure 2. Sioux Lookout fire 48, 2011. Photo by David L. Martell, University of Toronto.



# MEETINGS AND CONFERENCES

## CORS Business Meetings

November 25, 2011	CORS Council Meeting, Teleconference
January 27, 2012	CORS Council Meeting, Toronto, ON
March 30, 2012	CORS Council Meeting, Teleconference
June 10, 2012	CORS Council Meeting, Niagara Falls, ON
June 11, 2012	CORS Council Meeting, Niagara Falls, ON
June 12, 2012	CORS Annual General Meeting, Niagara Falls, ON

## CORS Annual Conferences

June 11-13, 2012	Joint CORS-Multi Objective Programming Goal Programming (MOPGP) Conference, Niagara Falls, ON <a href="http://www.cors.ca/cors2012">http://www.cors.ca/cors2012</a>
2013	CORS Annual Conference Vancouver, BC

## Other Conferences

2011 Nov. 19-22	2011 Decision Sciences Institute Annual Conference, Boston, MA <a href="http://www.decisionsciences.org/Annualmeeting/default.asp">http://www.decisionsciences.org/Annualmeeting/default.asp</a>
2012 Jan. 29 – Feb. 2	Discrete Choice Analysis: Predicting Demand And Market Shares, Lausanne, Switzerland <a href="http://transp-or.epfl.ch/dca/">http://transp-or.epfl.ch/dca/</a>
2012 April 20-23	Production and Operations Management Society's (POMS) Annual Conference, Chicago, IL <a href="http://www.poms.org/2011/07/poms_spring_2012_chicago_confe_1.html">http://www.poms.org/2011/07/poms_spring_2012_chicago_confe_1.html</a>
2012 July 8-11	25th European Conference on Operational Research, Vilnius, Lithuania <a href="http://www.euro-2012.lt/">http://www.euro-2012.lt/</a>
2012 Oct. 14-17	INFORMS 2012, Phoenix, AZ
2013 Oct. 6-9	INFORMS 2013, Minneapolis, MN
2014 Nov. 16-19	INFORMS 2014, San Francisco

## WWW Conference Listings

CORS / SCRO Conference Page: [http://www.cors.ca/en/conferences/i\\_other.php](http://www.cors.ca/en/conferences/i_other.php)  
INFORMS Conference Home Page: <http://www.informs.org/Conf/Conf.html>  
IFORS Conferences: <http://www.ifors.org/panorama/conferences/index.shtml>  
Netlib Conferences Database: <http://www.netlib.org/confdb/Conferences.html>  
SIAM Conference Home Page: <http://www.siam.org/meetings/calendar.php>  
POMS Conference Page: <http://www.poms.org/conferences/>



# CORS FUNDING OPPORTUNITIES

## Graduate Student Conference Support (GSCS) Program

CORS has established the GSCS program to encourage attendance of graduate students at conferences, symposia, or workshops specifically aimed at graduate students, such as student conferences, doctoral colloquia, and conferences for junior operations researchers. CORS may provide partial funding up to \$500 per student for attendance at such events. Note that the GSCS program will *not* fund attendance at CORS meetings, because CORS has a separate program for this purpose. All GSCS funding is subject to availability of funds and the following eligibility criteria:

- Student is a member of CORS.
- Student's supervisor is a member of CORS.
- Student is enrolled in a graduate program in a field related to operational research.
- Student is studying at a Canadian university, or is a Canadian citizen or permanent resident studying abroad.

The application process is competitive. The following criteria will be used to select applications that will be funded:

- The quality of the paper to be presented at the conference, if applicable.
- The benefits that the student is likely to derive from attending the conference.
- The stage that the student has reached in his/her degree program.
- Prior GSCS funding received by the applicant (new applicants will be given preference, all else being equal).

An online application form for GSCS funding is available at:

[http://www.cors.ca/en/students/i\\_graduate.php](http://www.cors.ca/en/students/i_graduate.php) .

Since funding is limited, applicants are encouraged to submit their applications in a timely manner. Applications must be received at least two months before the conference date to receive full consideration. Applicants who meet this deadline will be notified of the outcome of their application at least one month before the conference date.

For further information, contact the CORS GSCS Coordinator:

Fredrik Odegaard

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## **INFORMS Teaching Effectiveness Colloquium (For Faculty)**

In conjunction with the Annual INFORMS Meetings, INFORMS hosts a Teaching Effectiveness Colloquium. CORS has funding available to partially support a limited number of faculty members interested in attending. Faculty members that are awarded funding are expected to:

- give a presentation in an OR/MS Education session at CORS National Meeting, and
- write a short article regarding OR/MS education for the CORS Bulletin.

Funding is restricted to faculty members, and not available to graduate students. For more information and instructions on how to apply please contact:

Fredrik Odegaard  
CORS Education Chair  
email: [fodegaard@ivey.uwo.ca](mailto:fodegaard@ivey.uwo.ca)

## **CORS Traveling Speakers Program**

The Traveling Speakers Program (TSP) enables local sections to bring Canadian O.R. practitioners / researchers as speakers to their local events. In order to keep costs in line while maximizing the CORS National profile, CORS sponsorship will be limited to 50% of the total expenses, up to a maximum of \$500 per speaker or \$1 000 for a single event (conference, workshop). Other expenses can be covered by the local section. The program of the event must acknowledge the contribution of CORS. Each local section must contact the TSP coordinator to obtain approval for funding preferably at least one month in advance of the event date. Payment will be made by the CORS Treasurer upon receipt of the expense report.

Armann Ingolfsson  
CORS TSP Coordinator  
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## THE NEXT ISSUE

The next issue of the Bulletin is scheduled to appear in February 2012. Apart from the regular features and news from the local sections, it will have up to date information about the next year's conference in Niagara Falls.. Contributions to this issue, especially news on the activities of local sections or CORS Members should be submitted by **January 16, 2012**:

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The preferred method of submission is by a MS-Word attachment to an e-mail.

## CORS BULLETIN ADVERTISING POLICY

Ads cost \$120 per page, proportional for fractional pages. Logos and prepared layouts can be accommodated. This fee also includes distribution of the advertisement on the CORS ListServ. Direct inquiries to the Editor.

## CORS LISTSERV

As a benefit of membership, members may use the CORS ListServ to transmit messages, announcements, and job postings to the entire membership or to a targeted subgroup such as a local section. For example, you can send

- messages regarding the activities and business of the Society;
- announcements about conferences, conference sessions, special journal issues, seminars or other activities provided that these are related to operational research in its broadest sense;
- job postings of general interest to CORS members.

The ListServ is not used for commercial purposes, and all messages are vetted before they are sent out. To submit items to the ListServ, email Wendy L. Caron, CORS Membership Services at [caronwendyl@symaptico.ca](mailto:caronwendyl@symaptico.ca).

For non-members, a fee of \$60 is charged for the distribution of Job Postings and other announcements or messages of interest to the CORS membership.



Canadian Operational Research Society  
Société canadienne de recherche opérationnelle

The **Canadian Operational Research Society** was founded in 1958. Its goal is to advance the theory and practice of O.R. and to stimulate and promote contacts between people interested in the subject.

**Publications:** A quarterly scientific journal called *INFOR* and a news *Bulletin*.

**Meetings:** An annual National Conference with award ceremony, occasionally organized jointly with an international society (IFORS, INFORMS), as well as numerous local events organized by the local sections.

**Local Sections:** CORS has twelve local sections located throughout Canada and three student sections.

**Awards and Prizes:** CORS presents the following annual Awards and Prizes at its National Conference:

**Award of Merit** for significant contributions of a present or past member of CORS to the profession of O.R.

**Harold Larnder Memorial Award** to an individual who has achieved international distinction in O.R.

**Omond Solandt Award** to an organization, private or governmental, that is deemed to have made an outstanding contribution to O.R. in Canada.

**Practice Prize** for the challenging application of the O.R. approach to the solution of applied problems.

**Service Award** for outstanding contributions of time and service to the Society.

**Student Paper Competition** to recognize the contribution of a paper either directly to the field of O.R. through the development of methodology or to another field through the application of O.R.

**Graduate Student Funding:** CORS encourages attendance of graduate students at conferences, symposia, or workshops by providing partial funding. Visit CORS website for details.

**CORS Diploma:** This diploma is awarded to students graduating from a university curriculum comprising several O.R. courses. Criteria and an example certificate may be found on the CORS website.

**Membership Directory:** An online Directory of CORS Members is available as a membership benefit.

**To join CORS:** Go to the CORS website ([www.cors.ca](http://www.cors.ca)) and join online by credit card using the form found under membership services or complete the PDF application form found on the CORS website and mail it with payment to the address below.

**Fees:** Member \$75 Retired Member \$37.50 Student Member \$35

**Web site:** <http://www.cors.ca>

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