

The  
**XIX International Conference  
on Neutrino Physics and  
Astrophysics**

June 16 - 21, 2000

Laurentian University  
Sudbury, Canada



**NEUTRINO  
2000**  
Sudbury Canada

**FINAL PROGRAM**



# CONFERENCE COMMITTEES

## International Advisory Committee

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P. Doe (Washington)	J. Law (Guelph)	(British Columbia)

# CONFERENCE SECRETARIAT

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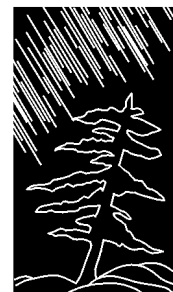
## Conference Secretariat

Mr. Pierre Lamoureux  
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**NEUTRINO**  
**2000**  
Sudbury, Canada

## Welcome To Neutrino 2000

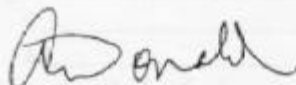
On behalf of the Conference Organizing Committee, I would like to welcome all delegates and accompanying persons to the Neutrino 2000 conference, to Canada, and to the Sudbury area. We are very excited about the strong international response to the conference and hope that everyone will enjoy the scientific presentations, the opportunities for interaction with other delegates and the conference social program.

Members of the SNO collaboration will be pleased to escort you on tours of the Observatory at the times specified throughout the week. The people of Sudbury have been very supportive of the SNO project and of the local science centre, Science North. We are sure that you will enjoy your visit to this interesting region of Canada, and the local hospitality.

We would like to extend our thanks to the many sponsors who have supported the conference and will be your hosts at a number of the social events.

We hope that this will be a week of very interesting discussions in this rapidly developing area of science as well as a series of pleasant social experiences.

Enjoy!



Art McDonald  
*Conference Chair*

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## To Neutrino 2000 Participants:

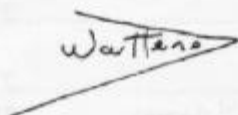
On behalf of the entire university community, it gives me great pleasure to extend you a warm welcome to our beautiful campus! Our proximity to The Sudbury Neutrino Observatory, to a world-renowned mining area and forest products industry and to the lakes and wilderness of northern Ontario give Laurentian unique and exciting activities and challenges.

As a member of the Sudbury Neutrino Observatory (SNO) Institute, Laurentian University is proud to co-host, with SNO, the XIX International Conference on Neutrino Physics and Astrophysics - NEUTRINO 2000. Conference participants will find delight in the sights and sounds that our northern region has to offer, and I hope your stay on our campus is enjoyable.

Dr. Art McDonald, Conference Chair, Dr. Doug Hallman, Local Arrangements Chair and members of both the International Advisory Committee and Local Organizing Committee are to be commended for their conscientious dedication and commitment to the success of this important conference.

We wish you a productive and insightful conference. I look forward to meeting you at the Conference Banquet!

Yours sincerely,



Dr. Jean Watters  
President



Laurentian University  
Université Laurentienne

## A MESSAGE OF WELCOME

*"The important thing is not to stop questioning. Curiosity has its own reason for existing. One cannot help but be in awe when one contemplates the mysteries of eternity, of life, of the marvelous structure of reality. It is enough if one tries merely to comprehend a little of this mystery every day."*

**ALBERT EINSTEIN**

It is with great pride and pleasure that we welcome delegates and their guests to Sudbury, Ontario, Canada -- host city for *Neutrino 2000*, the 19<sup>th</sup> International Conference on Neutrino Physics and Astrophysics.

What a tremendous opportunity for our community to showcase its internationally-acclaimed accomplishments in land reclamation, mining automation, cancer treatment, and of course, scientific discovery.

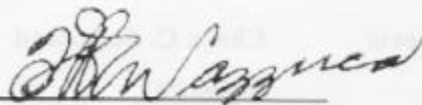
What a tremendous opportunity for you as delegates to network with 350 senior scientists from more than 30 countries, to participate in study tours and discussions, and to share ideas and papers on the latest developments in the field of neutrino research.

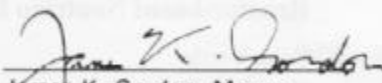
What a tremendous opportunity for both you and your accompanying guests to experience firsthand the natural beauty, diverse culture and warm hospitality that make the Sudbury experience so unique.

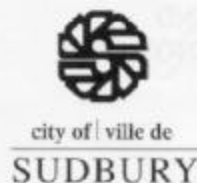
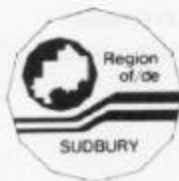
This conference is being hosted by Laurentian University and the Sudbury Neutrino Observatory (SNO), two institutions that have received standing ovations on the world stage - Laurentian for its expertise in distance education; SNO for its high-level scientific research.

The Neutrino Observatory is a multi-million dollar operation that provides tangible proof not only that neutrinos exist, but perhaps even more amazing, that government at all levels and the private sector can collaborate in a positive and productive manner.

We continue to work together as a community to develop a progressive and prosperous region in this third millennium, and we are proud to welcome the world to our home.

  
Frank R. Mazzuca, Chair  
Regional Municipality of Sudbury

  
James K. Gordon, Mayor  
City of Sudbury



# SCIENTIFIC PROGRAM

Friday, June 16

**DAY 1:            OPENING, SOLAR NEUTRINOS, REACTOR NEUTRINOS**

<b>Session 1:</b>	<b>Opening Lectures</b>	<b>Chair: G. Ewan</b>
09:00–09:15	Welcoming Remarks	
09:15–09:40	Opening Presentation	<i>E. Witten</i>
09:40–10:05	IUPAP Centennial Speaker Astrophysical Neutrinos in the 20 <sup>th</sup> Century and Beyond	<i>J.N. Bahcall</i>
<b>10:05–10:25</b>	<b><i>Coffee Break - Fraser Cafeteria</i></b>	
<b>Session 2:</b>	<b>Solar Neutrino Observations</b>	<b>Chair: R. Moessbauer</b>
10:25–10:50	SNO	<i>A. McDonald</i>
10:50–11:15	Super-Kamiokande	<i>Y. Suzuki</i>
11:15–11:35	SAGE	<i>V. Gavrin</i>
11:35–11:55	GNO	<i>E. Bellotti</i>
11:55–12:15	Homestake	<i>K. Lande</i>
<b>12:15–13:50</b>	<b><i>Lunch - Great Hall</i></b>	
		<b>Chair: T. Kirsten</b>
13:50–14:10	BOREXINO	<i>G. Ranucci</i>
14:10–14:35	Future Solar Neutrino Detectors	<i>F. von Feilitzsch</i>
<b>Session 3:</b>	<b>Solar Neutrinos: Theory &amp; Analysis</b>	<b>Chair: E. Akhmedov</b>
14:35–15:00	Review of Solar Models and Helioseismology	<i>S. Turck-Chieze</i>
15:00–15:25	Global Analysis of Solar Neutrino Data	<i>M. Gonzalez-Garcia</i>
<b>15:25–15:45</b>	<b><i>Coffee Break - Fraser Cafeteria</i></b>	
<b>Session 4:</b>	<b>Reactor-based Neutrino Experiments</b>	<b>Chair: C. Bemporad</b>
15:45–16:05	Palo Verde	<i>G. Gratta</i>
16:05–16:25	KamLAND	<i>A. Piepke</i>
16:25–16:45	MUNU	<i>C. Brogini</i>
<b>Session 5:</b>	<b>Contributed Papers</b>	
16:45–17:00	ORLAND	<i>F. Avignone</i>
17:00–17:15	KRASNOYARSK	<i>L. Mikaelyan</i>

## Saturday, 17 June



### DAY 2:           ATMOSPHERIC & ACCELERATOR NEUTRINOS

#### Session 6:           Atmospheric Neutrinos I: Results           Chair: T. Kajita

09:00–09:25	Super-Kamiokande	<i>H. Sobel</i>
09:25–09:45	Soudan-2	<i>T. Mann</i>
09:45–10:05	MACRO	<i>B. Barish</i>
10:05–10:25	Baksan	<i>S. Mikheyev</i>

**10:25–10:45**       *Coffee Break - Fraser Cafeteria*

**Chair: T. Gaisser**

10:45–11:05	Future Atmospheric Neutrino Detectors	<i>A. Geiser</i>
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#### Session 7:           Atmospheric Neutrinos II: Theory/Analysis

11:05–11:30	Review of Sources of Atmospheric Neutrinos	<i>P. Lipari</i>
11:30–11:55	Analysis of Oscillations of Atmospheric Neutrinos	<i>E. Lisi</i>

**11:55–13:40**       *Lunch - Great Hall*

#### Session 8:           Accelerator-based Neutrino Oscillation Experiments

**Chair: V. Matveev**

13:40–14:00	CHORUS	<i>L. Ludovici</i>
14:00–14:20	NOMAD	<i>M. Mezzetto</i>
14:20–14:40	KARMEN	<i>K. Eitel</i>
14:40–15:00	LSND	<i>G. Mills</i>
15:00–15:20	K2K	<i>K. Nakamura</i>

**15:20–15:40**       *Coffee Break - Fraser Cafeteria*

**Chair: E. Bettini**

15:40–16:00	BOONE	<i>A. Bazarko</i>
16:00–16:20	MINOS	<i>S. Wojcicki</i>
16:20–16:50	ICANOE/OPERA	<i>A. Rubbia</i>

#### Session 9:           Accelerator-based Neutrino Measurements       Chair: E. Bettini

16:50–17:10	NUTEV	<i>K. McFarland</i>
17:10–17:30	DONUT	<i>B. Lundberg</i>

## Sunday, 18 June

### DAY 3: NEUTRINO FACTORIES, DOUBLE BETA DECAY, NEUTRINO MASS; OVERALL THEORETICAL IMPLICATIONS

#### Session 10: Accelerator-based Neutrino Measurements, Continued Chair: E. Beier

09:00–09:25	Neutrino Factories: Theoretical Motivation	<i>A. De Rujula</i>
09:25–09:45	Neutrino Factories: Accelerator Facilities	<i>E. Keil</i>
09:45–10:05	Neutrino Factories: Experimental Facilities	<i>H. Schellman</i>

#### Session 11: Double Beta Decay Chair: H. Klapdor-Kleingrothaus 10:05–10:30 Review of Double Beta Decay Experiments to Date *H. Ejiri*

#### 10:30–10:50 *Coffee Break - Fraser Cafeteria*

10:50–11:15	Review of Future Experiments	<i>E. Fiorini</i>
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#### Session 12: Neutrino Mass Direct Searches Chair: M. Baldo Ceolin

11:15–11:25	The Mainz Neutrino Mass Experiment	<i>C. Weinheimer</i>
11:25–11:45	The Troitsk Neutrino Mass Experiment	<i>V. Lobashev</i>
11:45–12:05	Tau Mass	<i>M. Roney</i>
12:05–12:30	Microcalorimeter Measurements	<i>F. Gatti</i>

#### 12:30–14:00 *Lunch - Great Hall*

#### Session 13: Overview & Implications of Neutrino Oscillation Results Chair: H. Murayama

14:00–14:25	Neutrino Properties	<i>B. Kayser</i>
14:25–14:50	Neutrino Mass Spectrum and Lepton Mixing	<i>A. Smirnov</i>
14:50–15:15	Origins of Neutrino Mass	<i>R. Mohapatra</i>
15:15–15:40	Neutrinos and Extra Dimensions	<i>K. Dienes</i>

#### 15:40–16:00 *Coffee Break - Fraser Cafeteria*

#### Session 14: Poster Session (Room F228) 16:00–17:20 Authors of Contributed Posters will be present for discussion.



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## Monday, 19 June

**Session 15: Public Lecture – Science North INCO Cavern**  
20:00–21:00 Neutrinos, Galaxies and Science Education *L. Lederman*

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## Tuesday, 20 June

### DAY 4: SUPERNOVAE; COSMOLOGY & DARK MATTER

**Session 16: Supernova Neutrinos** **Chair: P. Vogel**

09:00–09:25 Supernova Neutrino Detection *K. Scholberg*  
09:25–09:50 New Results in Core Collapse Supernova Theory *A. Mezzacappa*  
09:50–10:15 Neutrinos and the Supernova Origin of the Elements *Y. Qian*  
10:15–10:40 Neutrino Effects in Stellar Cooling *M. Prakash*

**10:40–11:00** *Coffee Break - Fraser Cafeteria*

**Session 17: Dark Matter Searches** **Chair: H. Robertson**

11:00–11:25 Review of Direct Dark Matter WIMP Experiments to Date *D. Akerib*  
11:25–11:40 DAMA *R. Bernabei*  
11:40–12:05 Review of Future Direct Dark Matter WIMP Experiments *V. Zacek*

**12:05–13:45** *Lunch - Great Hall*

**Chair: A. Morales**

13:45–14:10 Indirect Detection of Dark Matter *P. Gondolo*  
14:10–14:35 Axions: Review of Experiment & Theory *K. Van Bibber*

**Session 18: Dark Matter & Cosmological Structures** **Chair: P. Langacker**

14:35–15:00 Neutrinos and Structure of the Early Universe or Cosmological Parameters *M. Tegmark*  
15:00–15:25 Dark Matter and Galaxy Formation *J. Navarro*

**15:25–15:45** *Coffee Break - Fraser Cafeteria*

15:45–16:10 Baryonic Dark Matter *K. Griest*  
16:10–16:35 Cosmic Background Radiation *R. Bond*  
16:35–17:10 Cosmological Constant and Dark Energy *M. Turner*

**Session 19: Contributed Papers**  
17:10–17:25 Not Enough Stellar Mass MACHOS in the Galactic Halo *A. Milsztajn*

## Wednesday, 21 June

### DAY 5:            **ULTRA-HIGH ENERGY NEUTRINOS; COSMOLOGY & ASTROPHYSICS; CONFERENCE SUMMARY**

#### **Session 20:            Ultra-High Energy Neutrino Measurements    Chair: R. Stokstad**

09:00–09:20	AMANDA	<i>S. Barwick</i>
09:20–09:40	NESTOR	<i>L. Resvanis</i>
09:40–10:00	ANTARES	<i>L. Thompson</i>
10:00–10:20	Baikal	<i>G. Domogatsky</i>

#### ***10:20–10:40            Coffee Break - Fraser Cafeteria***

**Chair: A. Dar**

10:40–11:05	Review of Future Ultra-High Energy Neutrino Experiments	<i>C. Spiering</i>
11:05–11:30	Theoretical Predictions for Ultra-High Energy Neutrinos	<i>R. Gandhi</i>
11:30–11:55	Neutrinos and Ultra-Energetic Cosmic Rays	<i>T. Weiler</i>

#### ***11:55–13:40            Lunch - Great Hall***

#### **Session 21:            Other Astrophysics & Cosmology            Chair: M. Roos**

13:40–14:05	Highest Energy Cosmic Rays	<i>A. Letessier-Selvon</i>
14:05–14:30	High Energy Gamma Rays	<i>R. Mukherjee</i>
14:30–14:55	Lepton Asymmetry and Neutrino Oscillations	<i>R.R. Volkas</i>
14:55–15:20	Gamma Ray Bursters	<i>E. Waxman</i>

#### **Session 22:            Closing Session            Chair: G. Marx**

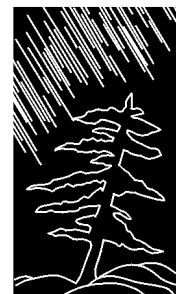
15:20–15:55	Conference Summary	<i>J. Ellis</i>
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## EXHIBITORS

Exhibitors are located in the Fraser Cafeteria, on the second floor of the Fraser Building.

Those companies or organizations exhibiting during the conference are listed below:

Wiener Plein & Baus Corp.  
Struck Innovative Systeme GmbH  
Reynolds Polymer Technology, Inc.  
Elsevier Science Inc.  
Region of Sudbury / Sudbury Regional Development Corp.  
INCO Limited



**NEUTRINO  
2000**  
Sudbury, Canada

Exhibit Hours		
Thursday	June 15	08:00-22:00h
Friday	June 16	08:30-16:00h
Saturday	June 17	08:30-16:00h
Sunday	June 18	08:30-16:00h
Tuesday	June 20	08:30-16:00h
Wednesday	June 21	08:30-14:00h

## CONTRIBUTED PAPERS

The contributed papers are in Room F227 (please follow the signs).

Titles are listed on pages 10–13.

## POSTERS

The posters are located in Room F228 (please follow the signs).

Titles are listed on pages 14–16.

<i>Posting Number</i>	<i>Abstract Title</i>	<i>Author(s)</i>
<b>C01 to C40: Theory</b>		
C01	Genuine CP Violation in a Neutrino Factory	M. Tanimoto
C02	Models of Neutrino Masses in Grand Unified Theories	G. Altarelli, F. Feruglio, I. Masina
C03	Measurement of the Mu and Tau Neutrino Masses from the Next Galactic Supernova	J.F. Beacom, P. Vogel
C04	Neutrino Magnetic Moments in the Presence of Mixing and a New Limit	P. Vogel, J.F. Beacom
C05	Bremstrahlung of Flavor-Degenerate Charged Lepton-Antilepton Pairs by Neutrinos (Antineutrinos) in the Field of Nuclei	L. Chatterjee, M.R. Strayer, J.S. Wu
C06	Flavor-Degenerate Pair Production in Neutrino-Nucleus Collisions	L. Chatterjee, M.R. Strayer, J.S. Wu
C07	Calculation of Atmospheric Neutrino Fluxes and Event Rates with the Fluka Model	G. Battistoni, A. Ferrari, P. Sala, T. Montarul, T. Rancati, A. Rubbia
C08	Tau Neutrinos Underground	S. Iyer, M.H. Reno, I. Sarcevic
C09	Is It Possible to Determine the S-Factor of the HEP Process from a Laboratory Experiment?	W.M. Alberico, J. Bernabeu, S.M. Bilenky, W. Grimus
C10	On a Possibility to Determine the S-Factor of the HEP Process in Experiments with Thermal (Cold) Neutrons	W.M. Alberico, S.M. Bilenky, W. Grimus
C11	Long-wavelength Neutrino Oscillations Induced by a Breakdown of Relativity and the Solar Neutrino Problem	A.M. Gago, H. Nunokawa, R. Zukanovich Funchal
C12	Seesaw Model and Its Lorentz Group Formulation	T.K. Kuo, Guo-Hong Wu, Shao-Hsuan Chiu
C13	Day-Night Effect Predictions for the SNO Detector	M. Maris, S.T. Petcov
C14	The Super-Kamiokande Day-Night Effect Data and the MSW Solutions of the Solar Neutrino Problem	M. Maris, S.T. Petcov
C15	Prospects for Observations of Ultra-High Energy Tau Neutrinos	A. Husain
C16	Neutrino Mass Matrix with Cyclic Permutation Invariant Form	Y. Koide
C17	Effective Majorana Neutrino Masses	K. Zuber
C18	Explicit SO(10) Supersymmetric Grand Unified Model	C.H. Albright, S.M. Barr
C19	Ultrahigh Energy Neutrinos and the Highest Energy Cosmic Rays	G. Domokos, S. Kovesi-Domokos
C20	Extra Quark-Lepton Generations and Precision Measurements	M. Maltoni, V.A. Novikov, A.N. Rozanov, M.I. Vysotsky
C21	Physics Potential of an ICANOE-like Detector at a Neutrino Factory	A. Bueno, M. Campanelli, A. Rubbia
C22	Matter Effects on Neutrino Oscillations in Long Baseline Experiments	I. Mocioiu, R. Shrock
C23	Not Enough Stellar Mass MACHOS in the Galactic Halo	A. Milsztajn, T. Lasserre
C24	Long-range Forces in Relic Cosmic Backgrounds	F. Ferrer, J.A. Grifols

<b>Posting Number</b>	<b>Abstract Title</b>	<b>Author(s)</b>
C25	Coherent Conversion of Neutrino Flavor by Collisions with Relic Neutrino Gas	I.S. Batkin, M.K. Sundaesan
C26	Double Beta Decay and the Future of Neutrino Physics	H.V. Klapdor-Kleingrothaus
C27	Alternative Gravities in the Neutrino Sector	H.V. Klapdor-Kleingrothaus, H. Pas, U. Sarkar
C28	High-Energy Neutrinos in Neutrino Environment	C. Lunardini, A.Yu. Smirnov
C29	Cosmic Ray Muon Data for Atmospheric Neutrino Calculations at Low Energies	L.V. Volkova
C30	Hard Bremsstrahlung Corrections to Neutrino-Electron Scattering	M. Passera
C31	How to Measure Leptonic CP Violation by Low Energy Neutrino Oscillation Experiments	H. Minakata, H. Nunokawa
C32	Long Range Majoron Fields and Supernova Neutrinos	L. Bento
C33	Double Beta Decay in Microscopic Variational Model and Deformation Effects	S.K. Dhiman, B.M. Dixit, P.K. Rath, P.K. Raina
C34	A Predictive Model for Neutrino Masses and Mixings	B. Stech
<b>C41 to C70: Neutrino Experiments</b>		
C41	Limits on Different Majoron Decay Modes of $^{100}\text{Mo}$ , $^{116}\text{Cd}$ , $^{82}\text{Se}$ and $^{96}\text{Zr}$ for Neutrinoless $\beta\beta$ Decays in the NEMO-2 Experiment	R. Arnold, C. Augier, J. Baker, A. Barabash, D. Blum, V. Brudanin, A.J. Caffrey, J.E. Campagne, E. Caurier, D. Dassie, V. Egorov, T. Filipova, R. Gurriaran, J.L. Guyonnet, F. Hubert, Ph. Hubert, S. Jullian, O. Kochetov, I. Kisel, V.N. Kornoukhov, V. Kovalenko, D. Lalanne, F. Laplanche, F. Leccia, I. Linck, C. Longuemare, Ch. Marquet, F. Mauger, H.W. Nicholson, I. Pilugin, F. Piquemal, J-L. Reyss, X. Sarazin, F. Scheibling, J. Suhonen, C.S. Sutton, G. Szklarz, V. Timkin, R. Torres, V. Umatov, I. Vanyushin, A. Varelle, V. Vasilyev, Ts. Vylov
C42	Future Reactor Neutrino Oscillation Experiments at Krasnoyarsk	L. Mikaelyan
C43	Detection of Very Small Neutrino Masses in Double-Beta Decay Using Laser Tagging	M. Danilov, R. DeVoe, A. Dolgolenko, G. Giannini, G. Gratta, P. Picchi, A. Piepke, F. Pietropaolo, P. Vogel, J-L. Vuilleumier, Y-F. Wang, O. Zeldovich
C44	Status of the Experiment on the Laboratory Search for the Electron Antineutrino Magnetic Moment at the Level $\mu_\nu \lesssim 3 \cdot 10^{-12} \mu_\beta$	L.N. Bogdanova, B.S. Neganov, V.N. Trofimov, A.A. Yukhimchuk, A.G. Beda, A.S. Starostin

<b>Posting Number</b>	<b>Abstract Title</b>	<b>Author(s)</b>
C45	Status Report of the NEMO-3 Detector for the Study of Neutrinoless Double Beta Decay at the Fréjus Underground Laboratory	X. Sarazin
C46	Calibration of Solar Neutrino Detectors with Artificial Neutrino Sources Based on $^{51}\text{Cr}$ and $^{75}\text{Se}$	V.N. Kornoukhov
C47	$0\nu\beta\beta$ Decays of $^{100}\text{Mo}$ by Elegant V at Oto Cosmo Observatory	N. Kudomi, H. Ejiri, K. Fushimi, K. Hayashi, T. Kishimoto, K. Kume, H. Kuramoto, K. Matsuoka, H. Ohsumi, K. Takahisa, S. Yoshida
C48	Results from the NOMAD $\nu_{\mu} \leftrightarrow \nu_e$ Oscillation Search	L. DiLella
C49	Measurement of the $\nu^0$ Polarisation in $\nu_{\mu}$ Charged-Current Interactions in NOMAD	L. DiLella
C50	Search for eV (Pseudo) Scalar Penetrating Particles in the Neutrino Beam from the CERN SPS	L. DiLella
C51	The NuMi Facility	J. Hlyen
C52	Recent Results from the CHORUS Search for $\nu_{\mu} \leftrightarrow \nu_{\tau}$ Oscillation	L. Ludovici
C53	Determination of the Neutrino Mass Squared from Lepton Scattering Near Threshold	J. Ciborowski, J. Rembielinski
C54	Genius First Real-Time Detector for Solar pp Neutrinos?	L. Baudis, H.V. Klapdor-Kleingrothaus
C55	Testing Solutions for the Atmospheric Neutrino Anomaly in the Long Baseline Experiments	O.L.G. Peres, A.M. Gago, L.P. Freitas, R. Zukanovich-Funchal
C56	Observing Ultra High Energy Neutrinos by Upward Tau Airshowers: Evidences in Batse Terrestrial Gamma Flashes	D. Fargion
C57	Status of the AQUA - RICH Project	E. Chesi, T. Ekelof, A. Grobheim, J. Learned, M. Rehnman, J. Seguinot, P. Weilhammer, T. Ypsilantis, A. Zichichi, K. Zuber
C58	The MONOLITH Project at Gran Sasso: What can be Learned from Improved Measurements of Atmospheric Neutrinos?	A. Geiser
C59	A GaAs Solar Neutrino Detector	V.N. Gavrin, Yu.P. Kozlova, E.P. Veretenkin, T.J. Bowles, A. Hime, V.K. Eremin, E.M. Verbitskaya, A.V. Markov, A.Yu. Polyakov
<b>C71 to C80: Other Experiments</b>		
C71	A CsI (TI) Scintillating Crystal Detector for the Studies of Low Energy Neutrino Interactions	H.T. Wong

<b>Posting Number</b>	<b>Abstract Title</b>	<b>Author(s)</b>
C72	A Neutrino-Factory Muon Storage Ring to Provide Beams for Multiple Detectors Around the World	D.B. Cline, Y. Fukui, A. Garren
C73	Detector for $^{222}\text{Rn}$ Measurements in Air at the 1 mBq/m <sup>3</sup> Level	J. Kiko
C74	Low-Level Radon Measurements for the BOREXINO Solar Neutrino Experiment	W. Rau, B. Freudiger, G. Heusser, M. Laubenstein, T. Kirsten, H. Simgen
C75	Cryo-Magnetic Rhenium Beta Spectroscopy	M.R. Gomes, P. Valko, T.A. Girard
C76	Gd-Loaded Liquid Scintillators for Solar Neutrino Experiments	S.L. Cartwright, V.A. Kudryavtsev, P.K. Lightfoot, J.E. McMillan, N.J.C. Spooner
C77	The KARMEN Time Anomaly: Search for a Neutral Particle of Mass 33.9 MeV in Pion Decay	M. Daum, M. Janousch, P.-R. Kettle, J. Koglin, D. Pocanic, J. Schotmuller, C. Wigger, Z.G. Zhao
<b>C81 to C100: Cosmology/Dark Matter/Supernova</b>		
C81	Hidden Source of High-Energy Neutrinos in Collapsing Galactic Nucleus	V.I. Dokuchaev, V.S. Berezhinsky
C82	Direct Mass Appearance of Neutrino Produced at Supernova LMC-'87A Observed on the Earth	H. Huzita
C83	A Parallax Analysis of Microlensing Candidate MACHO-SMC-97-1	D. Graff, T. Lasserre, A. Milstajin
C84	Detection of a Quark-Matter-Driven Neutrino Burst in Proto-Neutron Stars and Core Collapse Supernovae	G. Lugones, O.G. Benvenuto, H. Vucetich
C85	A New Super-Sensitive Detector System For WIMP Dark Matter	H.V. Klapdor-Kleingrothaus, L. Baudis, G. Heusser, B. Majorovits
C86	Sneutrino Cold Dark Matter and the Baryon Asymmetry of the Universe	H.V. Klapdor-Kleingrothaus, St. Kolb, V.A. Kuzmin
C87	Cosmological Implications of a Relic Neutrino Asymmetry	S. Pastor, J. Lesgourgues, S. Prunet
C88	Constraints on WIMPS from the Canfranc IGEX Dark Matter Search	A. Morales
C89	Searching for Signals from the Dark Universe: More Recent DAMA Results	R. Bernabei, P. Belli, R. Cerulli, F. Montecchia, M. Amato, G. Ignesti, A. Incicchitti, D. Prospero, C.J. Dai, H.L. He, H.H. Kuang, J.M. Ma
C90	Diagnostics of Supernova Neutrinos by SNO and Superkamiokande Experiments	H. Minakata, H. Nunokawa
C91	Neutrino Spectra and Oscillations from the Core Infall of a Nearby Supernova	A. Ray, F. Sutaria, D. Majumdar, A. Raychaudhuri, K. Kar

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<b>P01 to P20: Theory</b>		
P01	Understanding the Atmospheric Neutrino Problem	J.M. LoSecco
P02	CP Violations in Lepton Number Violation Processes and Neutrino Oscillations	K. Matsuda, N. Takeda, T. Fukuyama, H. Nishiura
P03	Solar Neutrino Solutions in Non-Abelian Flavor Symmetry	M. Tanimoto
P04	A Study of Solar Neutrino Survival Probability Using Bayesian Statistics	C.M. Bhat
P05	Calculation of Atmospheric Muon and Neutrino Fluxes with the Air Shower Simulation CORSIKA	J. Wentz, D. Heck, B. Vulpescu, A. Bercuci
P06	Constraints on Exotic Neutrino Mixing	J. Pantaleone
P07	Status of the Solution to the Solar Neutrino Problem Based on Non-Standard Neutrino Interactions	S. Bergmann, M.M. Guzzo, P.C. De Holanda, P.I. Krastev, H. Nunokawa
P08	Vacuum Energy: Quintessence vs. Cosmological Constant	S. Bludman
P09	Vacuum Oscillation Solution to the Solar Neutrino Problem in a Three Generation Framework	A.M. Gago, H. Nunokawa, R. Zukanovich Funchal
P10	Assessing Neutrino (1-3) Mixing Angle from Solar Neutrino Data	J.S. Kim, C.W. Kim
P11	The Dark Side of the Solar Neutrino Parameter Space	A. De Gouvea, A. Friedland, H. Murayama
P12	A 3D Calculation of Atmospheric Neutrino Fluxes	Y. Tserkovnyak, R. Komar, C. Nally, C. Waltham
<b>P21 to P40: Neutrino Experiments</b>		
P21	Measurement of the $\nu^0$ Polarisation in $\nu_\mu$ Charged-Current Interactions in NOMAD	L. DiLella
P22	Search for Heavy, Unstable Neutrinos Mixing to $\nu_\tau$	L. DiLella
P23	Weak and Magnetic Inelastic Scattering of Antineutrinos on Atomic Electrons	S. Fayans, L. Mikaelyan, V. Sinev
P24	Double Beta Decay Experiments with a Momentum Analyzer DCBA	N. Ishihara
P25	A 40MCi Antineutrino Tritium Source	A.A. Yukhimchuk, B.S. Neganov, V.N. Trofimov, L.N. Bogdanova
P26	Progress on the HERON Project	J.S. Adams, A. Fleischmann, Y.H. Huang, Y.H. Kim, R.E. Lanou, H.J. Maris, G.M. Seidel
P27	New Results of $^{116}\text{Cd}$ Double Beta Decay Study with $^{116}\text{CdWO}_4$ Scintillators	F.A. Danevich, A.Sh. Georgadze, V.V. Kobychiev, B.N. Kropivyansky, A.S. Nikolaiko, O.A. Ponkratenko, V.I. Tretyak, S.Yu. Zdesenko, Yu.G. Zdesenko



<b>Posting Number</b>	<b>Abstract Title</b>	<b>Author(s)</b>
P28	New Limits On Spin-Dependent Coupled Wimps And On 2B Processes In $^{40}\text{Ca}$ and $^{46}\text{Ca}$ by Using Low Radioactive $\text{CaF}_2$ (Eu) Crystal Scintillators	P. Belli, R. Bernabei, F. Montecchia, C.J. Dai, H.L. He, H.H. Kuang, J.M. Ma, F. Grianty, G. Ignesti, A. Incicchitti, D. Prosperi, O.A. Ponkratenko, V.I. Tretyak, Yu.G. Zdesenko
P29	Study of $^{116}\text{Cd}$ and $^{100}\text{Mo}$ $\beta\beta$ Decay with the BOREXINO Counting Test Facility (CAMEO Project)	F.A. Danevich, V.V. Kobychiev, B.N. Kropivnyansky, O.A. Ponkratenko, V.I. Tretyak, S.Yu. Zdesenko, Yu.G. Zdesenko, G. Bellini, B. Caccianiga, M.G. Gimmarchi
P30	New Experimental Limits on the Electron Stability and the Nuclear Levels Excitation of $^{23}\text{Na}$ , $^{127}\text{I}$ and $^{129}\text{Xe}$ Induced by the Electron's Decay on the Atomic Shell	P. Belli, R. Bernabei, F. Montecchia, C.J. Dai, H.L. He, H.H. Kuang, J.M. Ma, G. Ignesti, A. Incicchitti, D. Prosperi, O.A. Ponkratenko, V.I. Tretyak, Yu.G. Zdesenko
P31	Milano Direct Neutrino Mass Search with Thermal Microcalorimeters	A. Nucciotti, A. Alessandrello, C. Brofferio, O. Cremonesi, E. Fiorini, A. Giuliani, B. Margesin, M. Pavan, G. Pessina, S. Pirro, E. Previtali, M. Sisti, M. Zen
P32	The Neutrino's Electromagnetic Form-Factors. A Search for Neutrino-Electron Elastic Scattering as a Laboratory's Method of Magnetic Moment Measurement	L.A. Popeko, A.V. Chemy, G.A. Shishkina, L.A. Grigor'eva
P33	A Real Time Low Energy Solar Neutrino Detector Employing Liquid Helium or Liquid Neon Scintillators	D.N. McKinsey, R.A. Michniak, R. Alleaume, J.M. Doyle
P34	The HELLAZ Solar Neutrino Spectrometer: Status Report on the R&D	P. Gorodetzky
P35	Determining the Flavor Content of the Low-Energy Solar Neutrino Flux	A. De Gouvea, H. Murayama
P36	Spectroscopy of Inverse-Beta Decays and Double Beta Decays from $^{100}\text{Mo}$ for Solar Neutrinos and Neutrino Masses	H. Ejiri, J. Engel, R. Hazama, P. Krastev, N. Kudomi, R.G.H. Robertson
P37	The Oak Ridge Laboratory for Neutrino Detectors: Status	F.T. Avignone III, Yu. Efremenko
<b>P41 to P60: Other Experiments including SNO</b>		
P41	A CsI (TI) Scintillating Crystal Detector for the Studies of Low Energy Neutrino Interactions	H.T. Wong
P42	First Results about Atmospheric Muons from the L3+C Experiment at Cern	R. Nahnauer
P43	Profiling of Isotope Compositions for Neutrino Experiments	A.V. Tikhomirov
P44	Lead Perchlorate as a Neutrino Detection Medium	S.R. Elliott, P.J. Doe, R.G.H. Robertson
P45	Muon-Induced Spallation Events in the Sudbury Neutrino Observatory	A.D. Marino

<b>Posting Number</b>	<b>Abstract Title</b>	<b>Author(s)</b>
P46	The SNO Electronics System	E.W. Beier, D.F. Cowen, P.T. Keener, J.R. Klein, D. McDonald, M.S. Neubauer, F.M. Newcomer, R. Van Berg, R.G. Van de Water, P. Wittich
P47	Measuring the Neutral Current Event Rate in SNO Using $^3\text{He}(n,p)t$	R.G.H. Robertson, T.J. Bowles, T.V. Bullard, S.J. Brice, M.C. Browne, P.J. Doe, C.A. Duba, S.R. Elliott, E.I. Esch, R. Fardon, M.M. Fowler, A. Goldschmidt, R. Hazama, K.M. Heeger, A. Hime, K.T. Lesko, G.G. Miller, R.W. Ollerhead, A.W.P. Poon, K.K. Schaffer, M.W.E. Smith, T.D. Steiger, R.G. Stokstad, J.B. Wilhelmy, J. F. Wilkerson, J.M. Wouters
P48	Flux of Direct Muons in SNO	C. Waltham
P49	The SNO Calibration System	F. Duncan
P50	Optical Calibration of SNO	B.A. Moffat
P51	Energy Calibration of SNO	M. Boulay
P52	Low Energy Background Levels in the SNO Water Systems: An Overview	A.J. Noble
P53	The $\text{MnO}_x$ Radium Assay Technique for the SNO Detector	J. Farine
P54	The Seeded Ultra-Filtration Assay System for the SNO Experiment	H. Heron
P55	Radon Assays of the Water in the SNO Detector	H.W. Lee
P56	The SNO Cover Gas System	I. Levine
P57	SNO Detector Performance	R.G. Van de Water
P58	Wave Form Digitization for KamLAND	F. Bieser, C. Fong, S.J. Freedman, K.T. Lesko, K.B. Luk, A. Marino, D. Nygren, R. Stokstad, T. Stezelberger, H. Yaver
P59	Sudbury Neutrino Observatory PMT Support Structure	K.T. Lesko
<b>P71 to P80: Cosmology/Dark Matter/Supernova</b>		
P71	Neutrino Astrophysics at Boulby Mine	I. Liubarsky
P72	The CRESST Dark Matter Search	W. Seidel
P73	Supernova Trigger Implementation in SNO	R. Tafirout
P74	Searching for Supernovae Using the SNO Detector	J. Heise
P75	Signatures of Recent Merger Events in WIMP Detection Experiments	L.M. Widrow, D. Stiff, J. Frieman

# CONFERENCE INFORMATION

## On-Site Registration

The Conference Secretariat will operate a registration and information desk located in the Fraser Science Building at Laurentian University on the following dates and times:

Thursday, June 15	1500 – 2200 h
Friday, June 16	0700 – 1800 h
Saturday, June 17	0700 – 1800 h
Sunday, June 18	0700 – 1800 h
Tuesday, June 20	0700 – 1800 h
Wednesday, June 21	0700 – 1500 h



## Travel and Tours Desk

The Travel and Tours Desk is operated by Carlson Wagonlit / Seven Seas Travel. Using a “Remote Access System”, Carlson Wagonlit / Seven Seas Travel will provide delegates with “on-demand” services for changing hotel accommodation, airline travel, or tours. Please bring your travel questions to the Travel and Tours Desk during the operating hours of **08:30 – 17:30h** each day throughout the conference, except for Monday, June 19. If you need to contact the Travel and Tours Desk during non-business hours or from another location, please telephone 523-8600 (local).

## Airport Shuttle Service

Carlson Wagonlit / Seven Seas Travel is pleased to offer conference delegates a shuttle service from the airport at the start of the conference, and back to the airport for return flights. The price for the two-way shuttle is \$34 CDN. Carlson Wagonlit / Seven Seas Travel will operate a desk at the airport on June 13, 14, and 15 and will be able to provide assistance to arriving delegates who have booked their air travel or the airport shuttle through Carlson Wagonlit / Seven Seas Travel.

## Shuttles Returning to the Airport

Please contact the Travel and Tours Desk if you are interested in the return-to-airport shuttle and have not booked this service prior to arrival in Sudbury.

For all delegates who have booked the airport shuttle service with Carlson Wagonlit / Seven Seas Travel, please note that, to arrange a trouble-free return to the airport at the end of your stay at the conference, all delegates need to provide the following information to the Travel and Tours Desk **by 15:40h on Saturday, June 17** (the end of the afternoon coffee break): **Name, Departure Location (specify hotel or University), and time of departing flight**. With this information, a schedule will be posted in the Registration Area and hotel lobbies, listing the airport shuttle departure time for specific flights.

## **Transportation**

### **On-site Parking**

The parking lot in front of the Fraser Science Building, Laurentian University, is available for parking by conference delegates at no charge.

### **Shuttle Bus**

A shuttle service for delegates will be provided by the conference from the official conference accommodations only (Ramada Inn, Travelodge, Travelway Inn, Four Points, and Laurentian University Residence). The shuttle schedule is included in the delegate packages, and will be posted in the Fraser Science Building lobby (Registration Area) at Laurentian University, and at the hotels. Shuttle transportation will be provided to and from the sessions and hotels in the morning, at lunch, at the end of the day's sessions, and for scheduled evening events.

### **Audio-Visual Equipment**

Two overhead projectors, two 35 mm slide projectors, flipchart and one full multi-media projector for Powerpoint presentations will be provided at all sessions. Presenters who require additional equipment other than the equipment being provided by the Conference had to contact the Conference Secretariat by June 1, 2000.

For those delegates using Powerpoint for their presentations, please register on the sign-up sheet at the Registration Desk.

Facilities and assistance with transparencies and photocopying will be provided by Conference personnel.

### **Computer Terminals**

Computer terminals and printers will be available for use by delegates for checking e-mail or accessing overheads. The computer room is located on the third floor of the Fraser Building (please follow the signs). The operating hours for the terminal room will be posted at the room and in the Registration Area.

### **Lunch**

Laurentian University is some distance from area restaurants. Although the shuttle bus will operate during the lunch break, time is limited for delegates to travel back to their hotels and eat there or nearby. For the convenience of the conference delegates, a buffet lunch, including a number of food selections, is available at Laurentian University's Great Hall at a cost of \$15.

### **On-site Purchase of Lunch Tickets**

A limited number of tickets will be available for purchase at the Registration Desk for \$15 CDN per lunch. If, during the conference, you plan to purchase tickets for lunch on campus, please note the following deadlines.

For lunch on Friday, June 16

10:30h on Friday, June 16

For lunch on Saturday, June 17 & Sunday, June 18

15:45h on Friday, June 16

For lunch on Tuesday, June 20 & Wednesday, June 21

16:00h on Sunday, June 18

## Messages

Individuals wishing to contact registered delegates at the conference venue may telephone (705) 675-1151 ext. 2222 to leave a message during regular conference business hours. There is no paging of delegates, but all messages will be posted at a message centre near the conference registration desk located outside the plenary room.

## Foreign Exchange and Banking Facilities

Foreign exchange and regular banking services are available in all downtown banks. Hours are Monday to Friday, 09:00 to 16:00h. Exchange rates can be found at [www.xe.net/currency](http://www.xe.net/currency).



Many banks are located within walking distance of the conference hotels and all have automatic teller machines which can be accessed 24 hours a day by account holders and some credit cards. There is also an automatic teller machine at the University, near the Great Hall (where lunch is served).

## Taxes

A federal tax (GST) of 7% is applied to most goods and services in Canada and is similar to the value-added taxes (VAT) that exist in Europe. In addition, a provincial tax in Ontario of 8% is also applied to most goods and services. Non-residents can apply for a GST rebate on most goods purchased for use outside Canada.

Details are included in the booklet entitled “GST Rebate for Visitors” published by Revenue Canada, Customs and Excise, which will be available at the conference registration desk.

## Tipping in Canada

In Canada, it is customary to tip for services such as restaurants, bars and pubs, taxis and hairdressers, usually 15%, although the amount can range from 10% to 20% at the discretion of the person paying the bill. Always check whether a “service charge” or “gratuity” was included in a restaurant bill, especially if paying by credit card, as this is the tip. Bellhops, doormen, porters, etc., at hotels, airports and railway stations are generally paid \$1.00 per item of luggage.

## Liability

The conference fees **DO NOT** include provisions for the insurance of participants against personal injuries, sickness, theft or property damage. This also applies to any event held in conjunction with the official conference program. Participants and accompanying persons were advised to arrange for insurance they consider necessary. The Conference Organizing Committee, the Secretariat, sponsors and agents acting on behalf of the conference do not assume any responsibility for loss, injury or damage to persons or belongings, whatever their cause may be.

# SOCIAL PROGRAM

Shuttle bus transportation is provided for all events listed here from official conference accommodation only. Please wear your conference badge to all social events.

## Registration and Refreshments

The registration desk will be open from 15:00 to 22:00h on Thursday, June 15 at the Fraser Science Building, Laurentian University. Refreshments (coffee, tea, etc.) will be available in the Fraser Cafeteria, one floor above the registration area. From 18:00 to 20:00h, a bar will be open and light snacks will be available. Come then and see who has arrived for the conference.

## Refreshment Breaks

Refreshments will be provided before the morning sessions, at mid-morning, and at mid-afternoon each day of the conference.

## Welcoming Reception

A reception will be held at Science North, Sudbury's interactive science centre, for all registered delegates and registered accompanying guests from 18:30 to 22:00h on Friday, June 16. This reception is co-sponsored by the Regional Municipality of Sudbury, the City of Sudbury, and Science North. Cocktails will be available from 18:30h. After welcomes (at 19:00h) by representatives of the sponsors and the conference committee, delegates will be free (at 19:30h) to visit the exhibit areas of Science North, enjoy dinner (included) in one of several dining areas, and, after dinner (at 20:30h), enjoy several local entertainers.

A ticket for this event is included in the registration package: please bring your ticket to Science North. There is also a map in the registration package which will help you find your way around Science North during the evening. Dress: casual.

## Concert

On Sunday, June 18 at 20:00h in the Fraser Auditorium, Fraser Science Building, Laurentian University, a concert, *Jazz in a Classical Key*, featuring music from Debussy to Fats Waller, will be presented by well-known clarinetist James Campbell, pianist Gene Di Novi, and bassist Dave Young. The concert will last approximately 2 hours.

A post-concert reception will be held in the Fraser Cafeteria, hosted by Laurentian University and INCO Ltd. The reception will conclude by 23:00h.

A ticket for this event is included in the registration package: please bring your ticket to the concert. Dress: casual.

## Mid-Conference Excursions

Three exciting day-long excursions have been organized for all registered delegates and accompanying guests (see detailed descriptions on the next page).

## Public Lecture

On Monday, June 19, at 20:00h in the Science North INCO Cavern, a public lecture will be presented by Leon Lederman. Tickets are available to conference delegates. Delegates who are interested in attending this lecture are requested to obtain a ticket from the Registration Desk by 14:00h on Saturday, June 17.

## Conference Banquet

On the evening of Tuesday, June 20, at the Ramada Inn, a conference banquet and evening program have been arranged for delegates and accompanying guests from 18:30 to 22:00h. Cocktails are from 18:30 to 19:15h; we request delegates be seated by 19:30h. The menu has been designed to showcase Canadian cuisine, and we hope the delegates will enjoy the culinary treats prepared for them. Wine has been chosen to accompany the dinner, sponsored, in part, by Air Ontario. Music will be provided during dinner by the Sudbury Symphony String Quartet. After dinner entertainment will be performed by Philip Candelaria, Paul Dunn, and Sue Martinelli.

A ticket for this event is included in the registration package: please bring your ticket to the Ramada Inn. Dress: business.

## Sudbury Neutrino Observatory Tours

Underground visits to the laboratory will involve the wearing of mine coveralls (provided) and a 1 km walk to and from the SNO site. Groups are limited to 40 participants for each tour, but, due to overwhelming demand from delegates, **all** departure times have been modified. Please note the revised departure times for tours. Persons with medical or physical restrictions should contact the Registration Desk. Transportation from conference hotels or Laurentian University will be provided, as listed below.

				Departure Point	Hotel Return
1.	Thursday, 15 June	Group A	10:00	(pickup at hotels)	16:00h
2.	Thursday, 15 June	Group B	16:30	(Laurentian)	21:45h
3.	Saturday, 17 June	Group C	17:30	(Laurentian)	22:00h
		Group D	18:30	(pickup at hotels)	23:30h
4.	Wednesday, 21 June	Group H	14:00	(Laurentian)	19:45h
5.	Thursday, 22 June	Group I	07:15	(pickup at hotels)	12:30h
6.	Thursday, 22 June	Group J	10:00	(pickup at hotels)	16:00h

### NOTES:

Please check your registration package to verify which group you are assigned to. Please note the return times are approximate.

# MID-CONFERENCE EXCURSIONS

## Monday, June 19

A choice of a one-day excursion is included in the registration fee of all delegates and accompanying guests. (*All excursions offer highway coach transportation and lunch*).

### **MC-1      Manitoulin Island Historical Culture Tour**

This excursion will visit some of the natural features of Manitoulin Island in Lake Huron, west of Sudbury, the largest freshwater island in the world. It will highlight the rich aboriginal traditions which are being passed from one generation to the next. First is a visit to Wikwemikong Indian Reserve. Lunch is in West Bay, and then, a short distance from the lunch location, a visit to the new historical and native craft cultural centre. Here will be a demonstration of the traditional Pow Wow. Stops will be included at galleries and shops to purchase artwork or memorabilia.

Tour includes: return transportation from Sudbury, lunch, admissions, services of Manitoulin Island guides, and a group co-ordinator. Departure time from hotels: 07:30h; return to Sudbury approximately 18:00h.

### **MC-2      Georgian Bay – 30,000 Islands Cruise**

This excursion will begin with a 90-minute bus trip south from Sudbury to Parry Sound. There, the group will embark on the triple-decked *The Island Queen* sightseeing boat for a 3-hour cruise along the narrow channels and waterways of the 30,000 Islands of Georgian Bay. After the cruise, the group will have lunch, and then visit the West Parry Sound District Museum. The Museum features works of art and displays of logging, shipping, and life in this unique part of Canada, and, from time to time, also features special exhibits.

Includes: return transportation from Sudbury, cruise, lunch, admissions, services of a group co-ordinator. Departure time from hotels: 07:30h; return to Sudbury approximately 18:00h.

### **MC-3      Sudbury Neutrino Observatory and Sudbury Region**

Tours to the Sudbury Neutrino Observatory, located about 30 minutes west of Sudbury 2 km underground at INCO's Creighton Mine, are planned throughout the conference (see separate schedule). This mid-conference excursion is an option for some delegates who may not be able to participate in one of the other tours. A lunch and half-day tour of the Sudbury region includes a visit to scenic Onaping Falls and the A.Y. Jackson Lookout. A short, self-guided walking tour at the Lookout explains some of the geology of the area. Due to overwhelming demand, the schedule for these tours has been modified, as each tour can only accommodate 40 visitors.

Please check your registration package for information as to which MC-3 group you are in.

Departure times (from hotels):

Group E      07:00h, return to hotels approximately 17:15h.

\*Group F      10:00h, return to hotels approximately 16:30h

Group G      09:00h, return to hotels approximately 19:45h

\* Group F please note that due to time restrictions, only the SNO tour portion is provided to this group's participants.

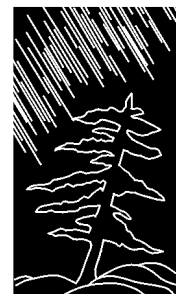


## ACCOMPANYING GUESTS' PROGRAM

The program for accompanying guests, and delegates who wish to participate, is intended to highlight the history, unique geographical features, and peoples and activities of this region of Canada. The Travel and Tours Desk at the conference will also offer information on other activities for individuals and on scheduled events in the region.

### On-site purchase of tickets

Tickets will be available for purchase on-site at the Travel and Tours Desk (operated by Carlson Wagonlit / Seven Seas Travel), but must be purchased by 12:00h (noon) of the day before the tour.



NEUTRINO  
2000  
Sudbury, Canada

### Accompanying Guests Program Schedule

(see below for details)

Friday	16 June	AG-1	Arts & Science (full day)
Saturday	17 June	AG-2	Museums & Nature (full day)
Sunday	18 June	AG-3	Sudbury City (full day) <b>CANCELLED</b>
Monday	19 June		Mid-Conference Excursion (included in registration fee)
Tuesday	20 June	AG-4	Relax & Cruise <i>or</i> Spa & Cruise (full day)
Wednesday	21 June	AG-5	Step Back in Time (half day)

Costs for the Accompanying Guest Tours, payable in advance, are indicated below. Payments for these tours are refundable only if the reservation was cancelled by June 1.

#### AG-1 Arts & Science

**Friday, 16 June**

This excursion will begin in the morning with a visit to the Centre Franco-Ontarien de Folklore, which, in 1996 received the Parks Canada Prize for its contribution to Franco-Ontarian heritage (approximately 30% of the region's population have a francophone background). The folklore archives contain thousands of audio recordings of tales, legends and songs. The next stop will be the Art Gallery of Sudbury, which is housed in the mansion of early lumber magnate William J. Bell. The gallery co-ordinator will escort the group through "Hand & Spirit", a juried exhibit, by the Ontario Crafts Council. A 20-30 minute stroll along the Boardwalk, on the shore of Lake Ramsey, ends at Science North, where lunch will be served. The afternoon can be spent touring the hands-on exhibits at Science North.

Cost: \$74.00 (includes transportation, lunch, admissions to all venues, taxes)

#### AG-2 Museums & Nature

**Saturday, 17 June**

This excursion starts with a trip to the Anderson Farm Museum, a 14-acre site which represents various aspects of the development of the Sudbury Region over the past 100 years. From here,

the group will travel to Onaping Falls to the A.Y. Jackson Lookout, named for the artist from the Group of Seven who painted the views from here. A short, self-guided walking tour explains

some of the geology of the area. This is followed by lunch, and then a visit to the Capreol Railway Museum, which has historical interest as the rail junction between Toronto and Ottawa on the rail route to the west of Canada.

Cost: \$64.00 (includes transportation, lunch, admissions to all venues, taxes)

**AG-3                      City of Sudbury    Sunday, 18 June**

**CANCELLED** \*\* Unfortunately, due to a lack of registrations, we have had to cancel this tour. A full refund will be provided by Carlson Wagonlit / Seven Seas Travel to those who registered for this tour.

**AG-4                      Relax & Cruise    Tuesday, 20 June**

This excursion will take the group a 45-minute drive south to Yesterday's Resort on the French River, and will include use of the facilities at the resort (indoor pool, whirlpool, sauna, outdoor trails and recreation), lunch, and a cruise on the historical French River aboard the *French River Queen*. While part of the group can enjoy a selection of scheduled spa treatments (additional option, *see below*), the others can enjoy the resort's facilities or the cruise. The cruise on the French River will follow the original route of the Ojibwa Indians on a key transportation link of the fur trade in North America for two centuries. Lunch will be served, and the groups will switch activities for the afternoon.

**AG-4A                      Relax & Cruise**

Cost: \$ 89.00 (includes transportation, light lunch, cruise, use of on-site facilities, taxes)

**AG-4B                      Spa & Cruise**

Cost: \$129.00 (includes all of AG-4A + \$50.00 certificate to be used toward Spa Services, which include: facials, moisturizing, massages, pedicures, manicures)

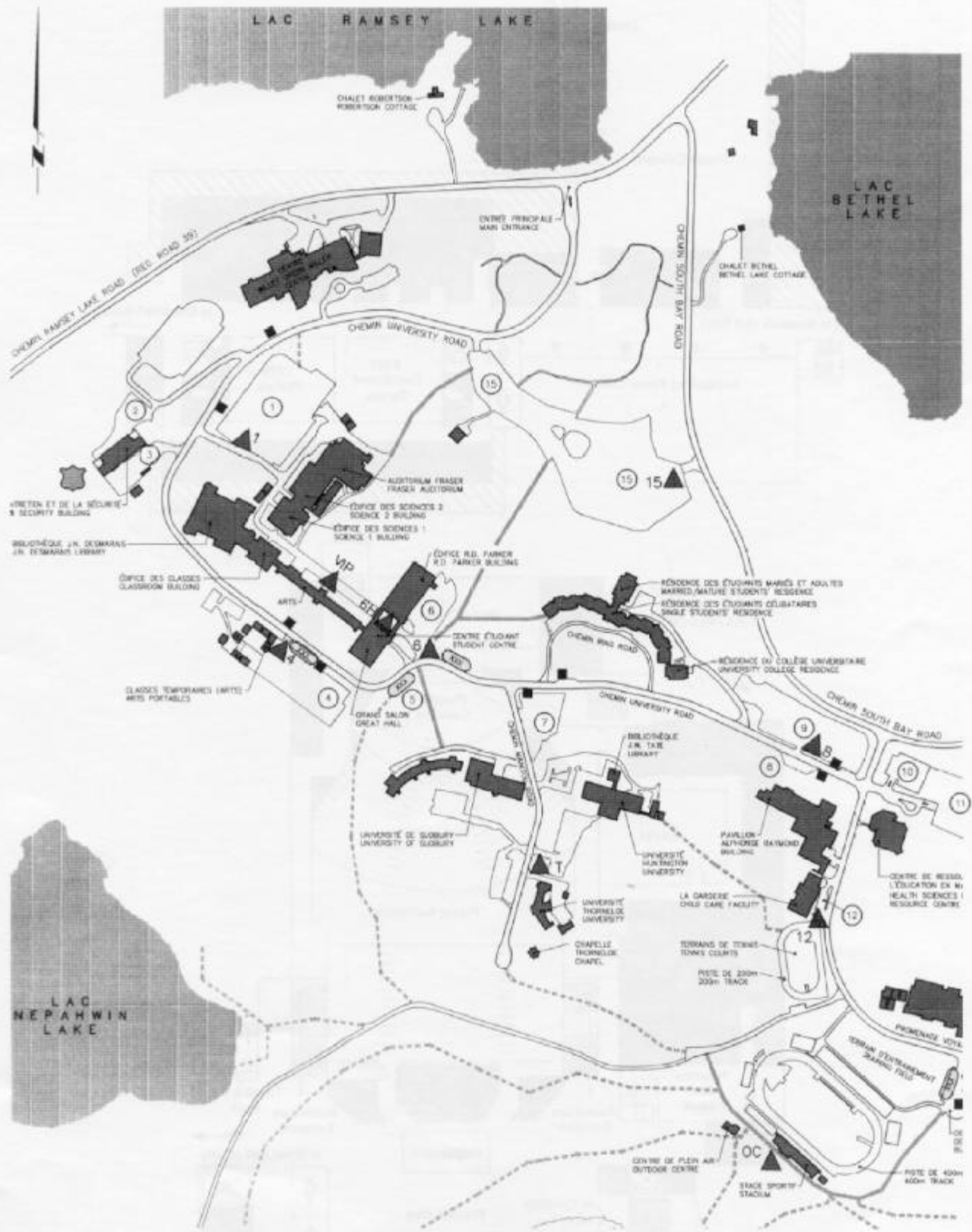
*Note:* This spa option must be selected at the time of booking.

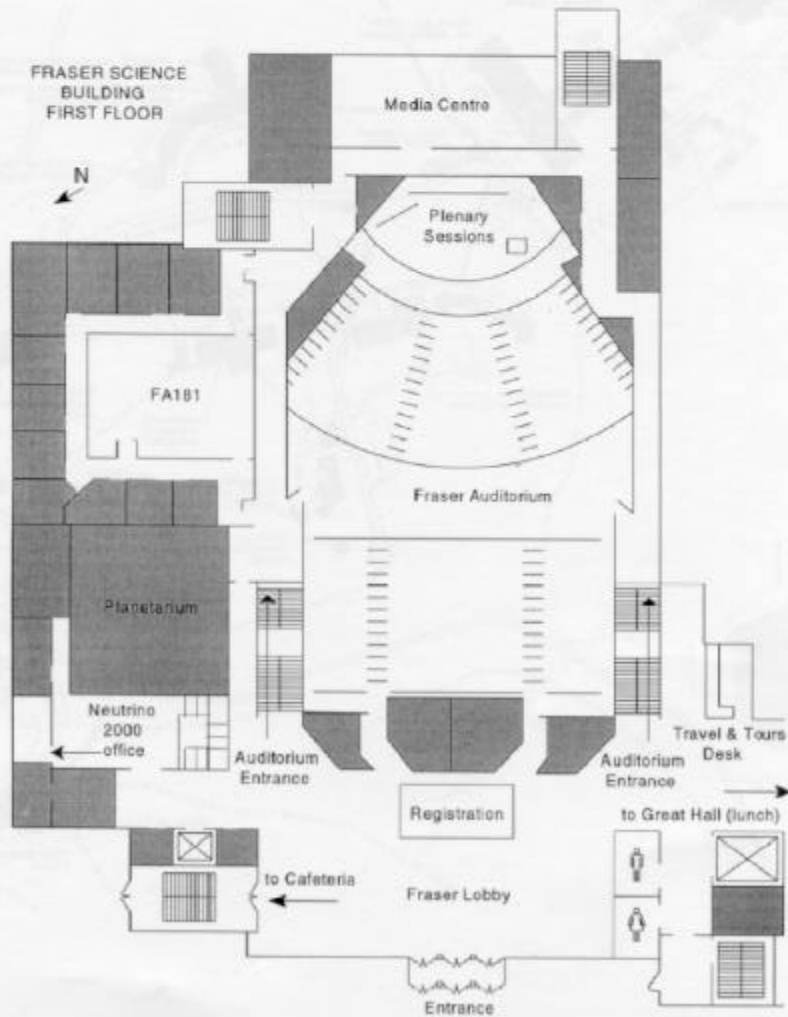
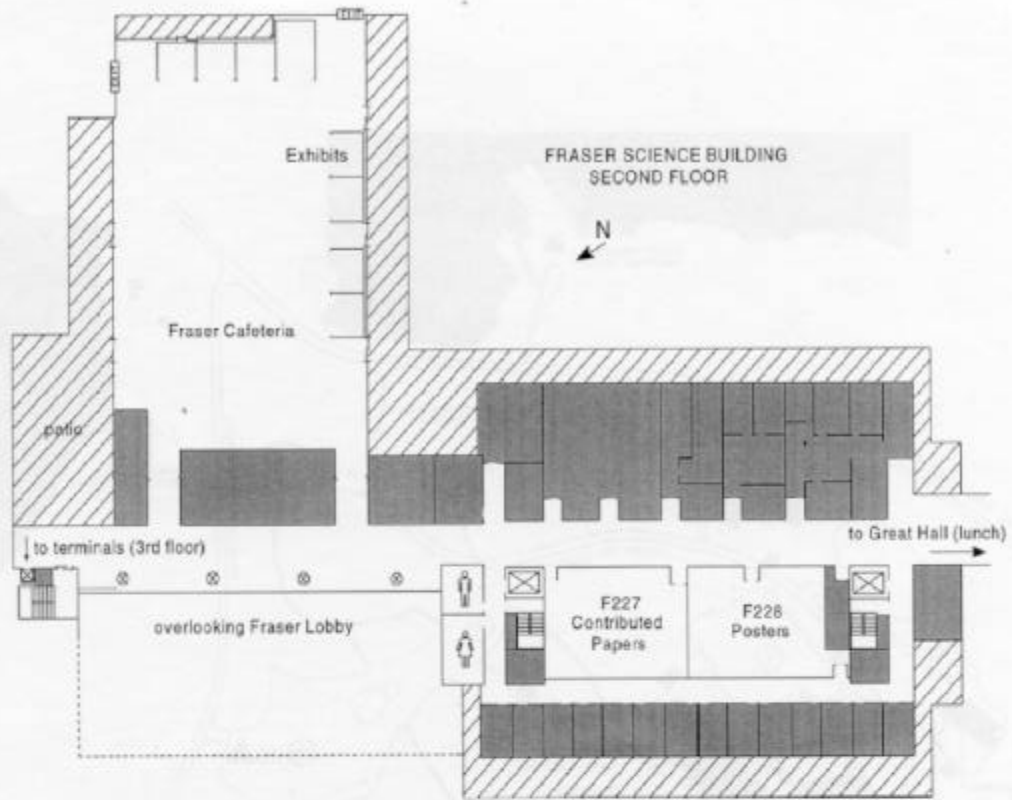
**On-site deadline for booking spa option: Friday, 16 June, 17:00h.**

**AG-5                      Step Back in Time    Wednesday, 21 June**

Fur trapping and trading constituted one of the main occupations of the original Nipissing tribe in northeastern Ontario. Late in the 18th century, the first fur trading post was opened. In 1848, the Hudson Bay Company established a permanent post on the west bank of the Sturgeon River, known as Sturgeon River House. It operated for thirty years until 1879. The current structure is a modern museum, housed within a log palisade, with exhibits highlighting the fur trapping and trading industry, and the Hudson Bay Company. Also on the grounds of Sturgeon River House, is Theodor Fourzeios Wetlands Park, with extensive self-guided nature trails. Along the boardwalk, visit the Cranberry Heritage pavilion, Songbird Station, Rest Rendezvous, Waterfowl Lookout & beaver lodge habitat, which feature some of the wildlife indigenous to northeastern Ontario. The group will return to Sudbury for lunch at Lloydsworth Hall, a restored 1910 Edwardian house.

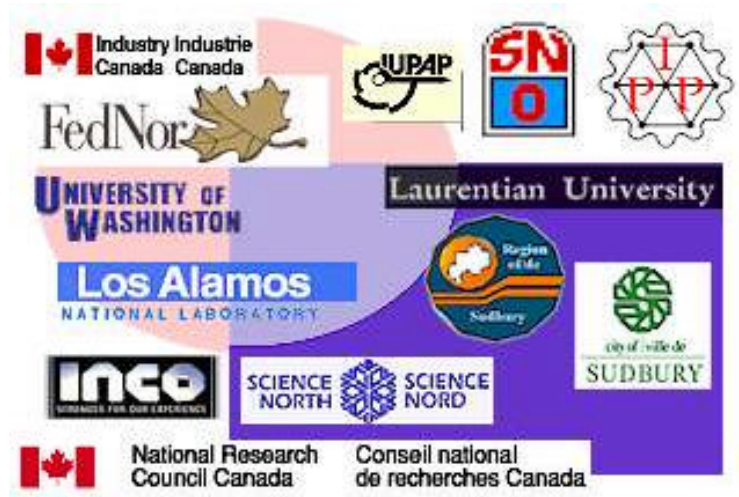
Costs: \$ 79.00 (includes transportation, lunch, admissions to all venues, taxes)





		Thursday June 15	Friday June 16	Saturday June 17	Sunday June 18	Monday June 19	Tuesday June 20	Wednesday June 21	Thursday June 22
			<b>DAY-1</b> OPENING, SOLAR NEUTRINOS, REACTOR NEUTRINOS	<b>DAY-2</b> ATMOSPHERIC & ACCELERATOR NEUTRINOS	<b>DAY-3</b> NEUTRINO FACTORIES, DOUBLE BETA DECAY, NEUTRINO MASS; OVERALL THEORETICAL IMPLICATIONS		<b>DAY-4</b> SUPERNOVAE; COSMOLOGY & DARK MATTER	<b>DAY-5</b> ULTRA-HIGH ENERGY NEUTRINOS COSMOLOGY & ASTROPHYSICS; CONFERENCE SUMMARY	
<b>MORNING</b>			<b>S1</b> Opening Lectures <i>(09:00 – 10:05)</i>	<b>S6</b> Atmospheric Neutrinos I : Results <i>(09:00 – 10:25)</i> <i>(10:45 – 11:05)</i>	<b>S10</b> Accelerator- based Neutrino Measurements <i>(con't)</i> <i>(09:00 – 10:05)</i>	MID CONFERENCE EXCURSIONS <i>(MC 1,2 &amp; 3)</i>	<b>S16</b> Supernova Neutrinos <i>(09:00 – 10:40)</i>	<b>S20</b> Ultra-High Energy Neutrino Measurements <i>(09:00 – 10:20)</i> <i>10:40 – 11:55)</i>	<i>*SNO Tour #5</i>
		<b>S2</b> Solar Neutrino Observations <i>(10:25 – 12:15)</i>	<b>S7</b> Atmospheric Neutrinos II: Theory/Analysis <i>(11:05 – 11:55)</i>	<b>S11</b> Double Beta Decay <i>(10:05 – 11:15)</i>	<b>S17</b> Dark Matter Searches <i>(11:00 – 12:05)</i>				
		<b>LUNCH</b>	<b>LUNCH</b>	<b>LUNCH</b>	<b>LUNCH</b>		<b>LUNCH</b>		
<b>AFTERNOON</b>	REGISTRATION DESK OPENS <i>Fraser Science Building</i> <i>(15:00 - 22:00)</i>  REFRESHMENTS  <i>*SNO Tours #1 &amp; #2</i>	<b>S2</b> Solar Neutrino Observations <i>(con't)</i> <i>(13:50 – 14:35)</i>	<b>S8</b> Accelerator-based Neutrino Oscillation Experiments <i>(13:40 – 15:20)</i> <i>(15:40 – 16:50)</i>	<b>S13</b> Overview & Implications of Neutrino Oscillation Results <i>(14:00 – 15:40)</i>		<b>S17</b> Dark Matter Searches <i>(con't)</i> <i>(13:45 – 14:35)</i>	<b>S21</b> Other Astrophysics & Cosmology <i>(13:40 – 15:20)</i>	<i>*SNO Tour #6</i>	
		<b>S3</b> Solar Neutrinos : Theory & Analysis <i>(14:35 – 15:25)</i>				<b>S14</b> Poster Session <i>(16:00 – 17:20)</i>	<b>S18</b> Dark Matter & Cosmological Structures <i>(14:35 – 17:10)</i>		<b>S22</b> Conference Summary <i>(15:20 – 15:55)</i>
		<b>S4</b> Reactor-based Neutrino Experiments <i>(15:45 – 16:45)</i>	<b>S9</b> Accelerator-based Neutrino Measurements <i>(16:50 – 17:30)</i>	<b>S19</b> Contributed Papers <i>(17:10 – 17:25)</i>					
		<b>S5</b> Contributed Papers <i>(16:45 – 17:15)</i>	<i>*SNO Tour #3</i>						
<b>EVENING</b>		WELCOMING RECEPTION <i>Sponsored by the Regional Municipality of Sudbury, the City of Sudbury and Science North</i>	FREE EVENING	CONCERT <i>"Jazz in a Classical Key"</i> <i>(20:00 – 22:00)</i>	<b>S15</b> PUBLIC LECTURE Science North, INCO Cavern <i>(20:00 – 21:00)</i>	CONFERENCE BANQUET			
		REGISTRATION DESK <i>(07:00 - 18:00)</i>	REGISTRATION DESK <i>(07:00 – 18:00)</i>	REGISTRATION DESK <i>(07:00 – 18:00)</i>	REGISTRATION DESK <i>(07:00 – 18:00)</i>	REGISTRATION DESK <i>(07:00 – 18:00)</i>	REGISTRATION DESK <i>(07:00 - 16:00)</i>		

# CONFERENCE SPONSORS



**Sudbury Neutrino  
Observatory**

**Regional Municipality  
of Sudbury**

**City of Sudbury**

**Laurentian University**

**Science North**

**INCO Limited**

**International Union of  
Pure and Applied Physics**

**Industry Canada (FEDNOR)**

**National Research Council  
of Canada**

**Los Alamos  
National Laboratory**

**Institute of Particle Physics  
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**Lawrence Berkeley  
National Laboratory**

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