

Publications, Conference Presentations, Invited Talks, and Awards

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Publications

Francis, R.; Moores, J.; Mclsaac, K.; Choi, D.; Osinski, G.: Observations of wind direction by automated analysis of images from Mars and the MSL rover, in *Acta Astronautica*. In press

Moores, J.; Francis, R.; Mader, M.; Osinski, G.; Barfoot, T.; Barry, N.; Basic, G.; Battler, M.; Beauchamp, M.; Blain, S.; Bondy, M.; Capitan, R.; Chanou, A.; Clayton, J.; Cloutis, E.; Daly, M.; Dickinson, C.; Dong, H.; Flemming, R.; Furgale, P.; Gammel, J.; Ghafoor, N.; Hussein, M.; Grieve, R.; Henry, H.; Jasiobedzki, P.; Lambert, A.; Leung, K.; Marion, C.; McCullough, E.; McManus, C.; Neish, C.; Ng, H.; Ozaruk, A.; Pickersgill, A.; Preston, L.; Redman, D.; Sapers, H.; Shankar, B.; Singleton, A.; Souders, K.; Stenning, B.; Stooke, P.; Sylvester, P.: A mission control architecture for robotic lunar sample return as field tested in an analogue deployment to the Sudbury impact structure, *Advances in Space Research*, available online 16 May 2012, 10.1016/j.asr.2012.05.008

Francis, R.; Vincent, R.; Noël J.; Tremblay, P.; Desjardins, D.; Cushley, A.; Wallace, M.: The Flying Laboratory for the Observation of ADS-B Transmissions, *International Journal of Navigation and Observation*, vol. 2011, article 973656, 2011.

Francis, R.: Detection of Automatic Dependent Surveillance – Broadcast signals using stratospheric and orbital platforms, Master's thesis, Royal Military College of Canada, May 2010

Conference papers and long-form reviewed abstracts

Francis, R.; Moores, J.; Maki, J.; Choi, D.; McCullough, E.; and the MSL Science Team: Constraints on atmospheric water vapour and circulation at Gale Crater from the MSL Atmospheric Monitoring Campaign (abstract #1717), in *44th Lunar and Planetary Science Conference*, The Woodlands, Texas, 18-22 March 2013

McCullough, E.; Moores J.; **Francis, R.** and the MSL Science Team: Inferences of Martian atmospheric dust and water ice content derived from radiative transfer models of passive MSL observations by MastCam (abstract #1288), in *44th Lunar and Planetary Science Conference*, The Woodlands, Texas, 18-22 March 2013

Osinski, G.; Abou-Aly, S.; **Francis, R.;** Hansen, J.; Marion, C.; Pickersgill, A.; Tornabene, L.: The Prince Albert structure, Northwest Territories, Canada: A new 28-km diameter com-

plex impact structure (abstract #2099), in *44th Lunar and Planetary Science Conference*, The Woodlands, Texas, 18-22 March 2013

Moores J.; Haberle, R.; Lemmon, M.; Bean, K.; Mischna, M. de la Torre Juarez, M.; Newman, C.; Calef, F.; Cantor, B.; Vasavada, A.; Maki, J.; Martin-Torres, J.; Zorzano, M.-P.; **Francis, R.**; McCullough, E.; the MSL Science Team and the MSL Engineering Camera Team: Constraints on atmospheric water vapour and circulation at Gale Crater from the MSL Atmospheric Monitoring Campaign (abstract #1548), in *44th Lunar and Planetary Science Conference*, The Woodlands, Texas, 18-22 March 2013

Francis, R.; Moores, J.; Mclsaac, K.; Choi, D.; Osinski, G.: Observations of wind direction by automated analysis of images from Mars and the MSL rover, in *63rd International Astronautical Congress*, Naples, Italy, 1-5 October 2012

Mader, M.; Osinski, G.; Shankar, B.; Tornabene, L.; Pickersgill, A.; Marion, C.; Barfoot, T.; Beauchamp, M.; **Francis, R.**; Ghafoor, N.; McCullough, E.; Moores, J.; Preston, L. and the ILSR team: Baseline scientific requirements for a lunar robotic precursor mission: lessons learned from analogue missions at the Mistastin (Kamestastin) Lake impact structure, Canada, in *63rd International Astronautical Congress*, Naples, Italy, 1-5 October 2012

Stenning, B.; Osinski, G.; Barfoot, T.; Basic, G.; Beauchamp, M.; Daly, M.; **Francis, R.**; Gammell, J.; Ghafoor, N.; Jasiobedzki, P.; Lambert, A.; Leung, K.; Mader, M.; Marion, C.; McCullough, E.; McManus, C.; Moores, J.; Preston, L.: Planetary surface exploration using a network of reusable paths: a paradigm for parallel science investigations, in *International Symposium on Artificial Intelligence, Robotics, and Automation in Space*, Turin, Italy, 4-6 September 2012

Francis, R.; Moores, J.; Osinski, G.: A mission control architecture for joint human and robotic lunar exploration missions, as tested in terrestrial analogue missions, in *Global Space Exploration Conference*, Washington, DC, 22-24 May 2012

Francis, R.; Osinski, G.; Moores, J.; Barfoot, T.; and the ILSR Team.: Co-operative human-robotic exploration of lunar analogue sites (abstract #1996), in *43rd Lunar and Planetary Science Conference*, The Woodlands, Texas, 19-23 March 2012

Kerrigan, M.; Shankar, B.; Marion, C.; **Francis, R.**; Pickersgill, A.; Capitan, R.; Osinski, G.; and the ILSR Team.: Real-time Mission Control Tracking of Astronaut Positions during Analogue Missions (abstract #2756), in *43rd Lunar and Planetary Science Conference*, The Woodlands, Texas, 19-23 March 2012

Marion, C.; Osinski, G.; Abou-Aly, S.; Antonenko, I.; Barfoot, T.; Barry, N.; Bassi, A.; Battler, M.; Beauchamp, M.; Bondy, M.; Blain, S.; Capitan, R.; Cloutis, E.; Cupelli, L.; Chanou, A.; Clayton, J.; Daly, M.; Dong, H.; Ferrière, L.; Flemming, R.; Flynn, L.; **Francis, R.**; Furgale, P.; Gammell, J.; Garbino, A.; Ghafoor, N.; Grieve, R.; Hodges, K.; Hussein, M.; Jasiobedzki, P.; Jolliff, B.; Kerrigan, M.; Lambert, A.; Leung, K.; Mader, M.; McCullough, E.; McManus, C.; Moores, J.; Ng, H.; Otto, C.; Ozaruk, A.; Pickersgill, A.; Pontefract, A.; Preston, L.; Redman, D.; Sapers, H.; Shankar, B.; Shaver, C.; Singleton, A.; Souders, K.; Stenning, B.; Stooke, P.; Sylvester, P.; Tripp, J.; Tornabene, L.; Unrau, T.; Veillette D.; Young, K.; Zanetti, M.: A Series of robotic and human analogue missions in support of lunar sample return (abstract #2333), in *43rd Lunar and Planetary Science Conference*, The Woodlands, Texas, 19-23 March 2012

- McCullough, E.; Pickersgill, A.; **Francis, R.**; Bassi, A.; Shankar, B.; Mader, M.; Beauchamp, M.; Osinski, G.; and the KRASH science and operations teams.: Scientific Application of Visual Systems Instrumentation used during Lunar Sample Return Analogue Missions (abstract #2687), in *43rd Lunar and Planetary Science Conference*, The Woodlands, Texas, 19-23 March 2012
- Moores, J.; **Francis, R.**; Osinski, G.; Mader, M.; McCullough, E.; Preston, L.; Tornabene, L., and the KRASH Operations and Science Team.: Surface operations for mission control during analogue human lunar deployments to Mistastin and Barringer impact structures (abstract #1136), in *43rd Lunar and Planetary Science Conference*, The Woodlands, Texas, 19-23 March 2012
- Pickersgill, A.; Osinski, G.; Beauchamp, M.; Marion, C.; Mader, M.; **Francis, R.**; McCullough, E.; Shankar, B.; Barfoot, T.; Bondy, M.; Chanou, A.; Daly, M.; Dong, H.; Furgale, P.; Gammell, J.; Ghafoor, N.; Hussein, M.; Jasiobedzki, P.; Lambert, A.; Leung, K.; McManus, C.; Ng, H.; Pontefract, A.; Stenning, B.; Tornabene, L.; Tripp, J.; and the ILSR Team.: Scientific Instrumentation for a Lunar Sample Return Analogue Mission (abstract #2657), in *43rd Lunar and Planetary Science Conference*, The Woodlands, Texas, 19-23 March 2012
- Pontefract, A.; Marion, C.; Osinski, G.; **Francis, R.**; Pickersgill, A.; Tornabene, L.; and the ILSR Team.: Use of Portable XRF and Raman for *in situ* Analysis in Manned Planetary Investigations.: Lessons Learned from the Kamestastin Lunar Analogue Mission (abstract #2086), in *43rd Lunar and Planetary Science Conference*, The Woodlands, Texas, 19-23 March 2012
- Shankar, B.; Osinski, G.; Abou-Aly, S.; Beauchamp, M.; Blain, S.; Chanou, A.; Clayton, J.; **Francis, R.**; Kerrigan, M.; Mader, M.; Marion, C.; McCullough, E.; Moores, J.; Pickersgill, A.; Pontefract, A.; Preston, L.; Tornabene, L.: Lunar Analogue Mission.: Overview of the site selection and traverse planning process for a human sortie mission at the Mistastin Lake Impact Structure, Labrador, Canada (abstract #1143), in *43rd Lunar and Planetary Science Conference*, The Woodlands, Texas, 19-23 March 2012
- Stenning, B.; Osinski, G.; Barfoot, T.; Basic., G.; Beauchamp, M.; Daly, M.; Dong, H.; **Francis, R.**; Furgale, P.; Gammell, J.; Ghafoor, N.; Jasiobedzki, P.; Lambert, A.; Leung, K.; Mader, M.; Marion, C.; McCullough, E.; McManus, C.; Moores, J.; Preston, L.: Planetary surface exploration using a network of reusable paths, in *43rd Lunar and Planetary Science Conference*, The Woodlands, Texas, 19-23 March, 2012
- Tornabene, L.; Osinski, G.; Mader, M.; Chanou, A.; **Francis, R.**; Jolliff, B.; Marion, C.; McCullough, E.; Pickersgill, A.; Sapers, H.; Souders, K.; Sylvester, P.; Young, K.; Zanetti, M.; and the KRASH Team.: Utility of remote sensing, robotic precursor data and a focused science hypothesis for a follow-on human exploration lunar analogue mission at the Mistastin Lake (Kamestastin) impact structure (abstract #2390), in *43rd Lunar and Planetary Science Conference*, The Woodlands, Texas, 19-23 March 2012
- Francis, R.**; Noël, J.; Vincent, R.: Orbital monitoring of Automatic Dependent Surveillance -- Broadcast (ADS-B) signals for improved air traffic surveillance in remote and oceanic airspace, in *62nd International Astronautical Congress*, Cape Town, South Africa, 3-7 October 2011
- Henry, H.; Mader, M.; Osinski, G.; Gilbert, A.; Battler, M.; Brown, P.; Chanou, A.; **Francis, R.**;

McCullough, E.; Papadimos, A.; Pontefract, A.; Shankar, B.; Singleton, A.; Thomson, L.; Unrau, T.: Making outreach and education a major component of research institutions.: A Canadian university perspective, in *62nd International Astronautical Congress*, Cape Town, South Africa, 3-7 October 2011

Moores, J. E.; **Francis, R.**; Barfoot, T.; Barry, N.; Basic, G.; Battler, M.; Beauchamp, M.; Blain, S.; Bondy, M.; Capitan, R-D.; Chanou, A.; Clayton, J.; Cloutis, E.; Daly, M.; Dickinson, C.; Dong, H.; Flemming, R.; Furgale, P.; Gammel, J.; Ghafoor, N.; Hussein, M.; Grieve, R.; Henry, H.; Jasiobedzki, P.; Lambert, A.; Leung, K.; Mader, M.; Marion, C.; McCullough, E.; McManus, C.; Neish, C.D.; Ng, H.K.; Ozaruk, A.; Pickersgill, A.; Preston, L.J.; Redman, D.; Sapers, H.; Shankar, B.; Singleton, A.; Souders, K.; Stenning, B.; Stooke, P.; Sylvester, P.; Tornabene, L.; Osinski, G.R.: Mission Operations Design for Lunar Sample Return as field-tested in an Analogue deployment to the Sudbury Impact Structure, in *EPSC-DPS Joint Meeting 2011*, Nantes, France, 2-7 October 2011

Moores, J. E.; **Francis, R.**; McCullough, E.; Choi, D.S.; Osinski, G.: Motivation for Atmospheric Measurements of Water Ice using the Mars Science Laboratory Instrument Suite and beyond, in *EPSC-DPS Joint Meeting 2011*, Nantes, France, 2-7 October 2011

Antonenko, I.; Mader, M.; Osinski, G.; Battler, M.; Beauchamp, M.; Cupelli, L.; Chanou, A.; **Francis, R.**; Marion, C.; McCullough, E.; Pickersgill, A.; Preston, L.; Shankar, B.; Unrau, T.; Veillette, D.: Issues of Geo-Focused Situational Awareness in Robotic Planetary Missions.: Lessons from an Analogue Mission at Mistastin Lake Impact Structure, Labrador, Canada, in *42nd Lunar and Planetary Science Conference*, The Woodlands, Texas, 7-11 March 2011

Marion, C.; Osinski, G.; Antonenko, I.; Barfoot, T.; Battler, M.; Beauchamp, M.; Cloutis, E.; Cupelli, L.; Chanou, A.; Daly, M.; Ferrière, L.; Flemming, R.; **Francis, R.**; Ghafoor, N.; Grieve, R.; Hodges, K.; Hussain, M.; Jolliff, B.; Mader, M.; McCullough, E.; Otto, C.; Preston, L.; Redman, D.; Shankar, B.; Singleton, A.; Stooke, P.; Sylvester, P.; Tornabene, L.; Unrau, T.; Veillette, D.: A Lunar Analogue Mission.: Sample Return to the South Pole-Aitken Basin, in *42nd Lunar and Planetary Science Conference*, The Woodlands, Texas, 7-11 March 2011

Shankar, B.; Antonenko, I.; Osinski, G.; Mader, M.; Preston, L.; Battler, M.; Beauchamp M.; Chanou, A.; Cupelli, L.; **Francis, R.**; Marion, C.; McCullough, E.; Pickersgill, A.; Unrau, T.; Veillette, D.: Lunar Analogue Mission.: Overview of the Site Selection Process at Mistastin Lake Impact Structure, Labrador, Canada, in *42nd Lunar and Planetary Science Conference*, The Woodlands, Texas, 7-11 March 2011

Vincent-Bonnieu, S.; Minster, O.; Dewandre, T.; **Francis, R.**; Liggieri, L.; Loglio, G.; Miller, R.; Steinchen, A.; Antoni, M.; Clause, D.; Del Gaudio, L.; Dalmazzone, C.; Karapantsios, T.; Dutschk, V.; Rubio, R.; Picker, G.: FASES.: An instrument for Fundamental and Applied Studies of Emulsion Stability, in *Third International Symposium on Physical Sciences in Space*, Nara, Japan, 22-26 October 2007

Vincent-Bonnieu, S.; Minster, O.; Dewandre, T.; **Francis, R.**; Langevin, D.; Adler, M.; Cohen-Addad, S.; Hohler, R.; Vandewalle, N.; Saint-Jalmes, A.; Weaire, D.; Hutzler, S.; Durian, D.; Bellossi, F.; Picker, G.: FOAM.: An instrument for coarsening of aqueous foam, in *Third International Symposium on Physical Sciences in Space*, Nara, Japan, 22-26 October 2007

Conference presentations with abstract review

- Francis, R.;** Mclsaac, K.; Moores, J.; Choi, D.; Osinski, G.: Observations of wind direction by automated analysis of ground-based cloud imagery: Applications on Earth and Mars, in *Canadian Space Summit 2012*, London, Ontario, 14-16 November 2012
- Marion, C.; Osinski, G.; Pickersgill, A; **Francis, R.;** Hansen, J.; Abou-Aly, S.: Prince Albert: A newly discovered impact structure on Victoria Island, Canadian high arctic, in *Canadian Space Summit 2012*, London, Ontario, 14-16 November 2012
- McCullough, E.; Moores, J.; **Francis, R.:** Proposed observations of water ice and dust in the martian lower atmosphere at Gale crater, in *Canadian Space Summit 2012*, London, Ontario, 14-16 November 2012
- Francis, R.;** Mclsaac, K.; Moores, J.; Osinski, G.; Natural scene segmentation to support planetary science, in *12th Space Vision and Advanced Robotics Workshop*, Brampton, Ontario, 6 June 2012
- Francis, R.;** Moores, J.; Mclsaac, K.; Choi, D.: Observations of wind direction on Mars by automated analysis of images from surface missions, in *2012 Canadian Meteorological and Oceanographic Society Congress*, Montreal, 29 May – 1 June, 2012
- Francis, R.;** Moores, J.; Osinski, G.; and the ILSR Team.: Analogue mission operations in support of future lunar sample return missions, in *Canadian Space Summit 2011*, Calgary, Alberta, 23-25 November 2011
- Francis, R.;** Jasiobedzki, P.; Mclsaac, K.; Osinski, G.: Automatic selection of instrument sampling locations in 3D imagery, in *11th Space Vision and Advanced Robotics Workshop*, Brampton, Ontario, 8 June 2011
- Francis, R.;** Osinski, G.; Barfoot, T.; Ng, H.; and the SLAM 2011 Team.: Sudbury Lunar Analogue Mission 2011.: Testing advanced vision systems for exploration missions, in *11th Space Vision and Advanced Robotics Workshop*, Brampton, Ontario, 8 June 2011
- Francis, R.:** Vision Systems for Exploration.: Enabling astrobiological investigations with autonomous robotics, in *2nd Canadian Astrobiology Training Program annual meeting*, Montreal, 29-31 May, 2011
- Francis, R.:** Air traffic surveillance in remote and oceanic airspace using orbital detection of Automatic Dependent Surveillance — Broadcast (ADS-B) signals, in *Canadian Space Summit 2010*, Ottawa, Ontario, 19-21 November 2010
- Francis, R.:** FLOAT.: A stratospheric research balloon for education and payload development, in *Canadian Space Summit 2009*, Kingston, Ontario, 20-22 November, 2009
- Francis, R.;** Tremblay, P.; Noel J.: CIMON.: The Canadian Magnetometric Observation Nanosatellites, in *Second European Cubesat Workshop*, Noordwijk, the Netherlands, 20-22 January 2009

Invited talks

Autonomous interpretation of natural scenes: Clouds, Wind, and efforts in Geology

- Machine Learning and Artificial Intelligence research groups
NASA Jet Propulsion Laboratory
Pasadena, California, 23 October 2012

Victoria Island CPSX 2012 Expedition

- Canadian Space Agency
St-Hubert, Québec, 6 August 2012

Broadcast interview on analogue mission operations and results

- Astronomy.FM, *Live From York University*, 26 September 2011

Broadcast interview on past and current work in the space sector

- Astronomy.FM, *Live From York University*, 13 June 2011

A Perspective on Space Programs Beyond North America

- Royal Astronomical Society of Canada, London Centre
London, Ontario, 20 May 2011
- Centre for Planetary Science and Exploration, University of Western Ontario, London,
Ontario, 28 January 2011
- Royal Astronomical Society of Canada, Kingston Centre
Kingston, Ontario, 11 December 2009

The European Space Agency.: Science, Exploration, and Operational programs

- Royal Military College of Canada
Kingston, Ontario, 2 October 2008

Broadcast interview on experience in the ESA Young Graduate Trainee Program,

- CBC Radio One, *Sounds Like Canada*, 27 August 2008

Newspaper interview on selection for the ESA Young Graduate Trainee Program

- *Northern Life*, Sudbury, Ontario, 21 June 2007

Broadcast interview on selection for the ESA Young Graduate Trainee Program,

- CBC Radio One, Points North, 14 June 2007

Selected awards

Canadian Space Agency Student Travel Grant: 63rd International Astronautical Congress, Naples, Italy, 2012

Northern Scientific Training Program Travel Grant for field research in robotic vision for geology at an unexplored impact structure on Victoria Island, Northwest Territories, 2012

Canadian Space Agency Student Travel Grant: 62nd International Astronautical Congress, Cape Town, South Africa, 2011

Northern Scientific Training Program Travel Grant for planetary analogue field studies at the Kamestastin Impact Structure, northern Labrador, 2011

CIC Officer Award of Excellence for duties as a flight instructor, 2010

NSERC CREATE Scholarship, Canadian Astrobiology Training Program, 2010

Defence Research and Development Canada full scholarship for graduate studies in Space Science at the Royal Military College of Canada, 2008

Dean's Honour List, University of Ottawa Faculty of Engineering, 2002

Central Region Gliding School A Flight Top Flying Instructor, 2001

University of Ottawa Entrance Scholarship, 2001

University of Ottawa Faculty of Engineering Scholarship, 2001

Sandvik Canada Scholarship, 2001

Air Cadet Post-secondary Scholarship, 2001

St. Benedict Catholic Secondary School RJ McCarthy Scholarship, 2001

Canadian Mathematics Competition, school top result, five times 1997-2001

Walter J. Piercy Memorial Award for Northern Ontario top cadet pilot, 1999

Royal Canadian Air Cadets Power Flying Scholarship, 1999

Royal Canadian Air Cadets Glider Pilot Scholarship, 1998