

FREDERICK J. NORTHRUP

Associate Professor of Instruction and Director of Undergraduate Studies

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EDUCATION:

Ph.D., Physical Chemistry, 1985, University of Toronto, Toronto, Ontario, Canada

Research Advisor: John C. Polanyi

B.Sc. (Honors), Chemistry, 1978, Dalhousie University, Halifax, Nova Scotia, Canada

AWARDS PRIOR TO NORTHWESTERN UNIVERSITY:

1985 NSERC (National Science & Engineering Research Council) Industrial Research Fellowship (IRF)

1984 NSERC Postdoctoral Fellowship - refused it to accept IRF at Ontario Hydro

1978 NSERC 1967 Centennial Graduate Scholarship (4 years)

1978 The Governor General's Gold Medal at Dalhousie University

1978 The University Medal in Chemistry (Dalhousie University)

1978 Society of Chemical Industry Prize

1977 Ross Stewart Smith Scholarship

Belle Crowe Scholarship in Chemistry

Dalhousie University Scholarship

1977 Chemical Institute of Canada Medal

1976 Belle Crowe Scholarship in Chemistry

1975 Charles and Cecilia Zwerling Scholarship

Dalhousie University Scholarship

1974 Dalhousie University Entrance Scholarship

Warner Lambert Canada Scholarship (4 years)

EMPLOYMENT:

Sept. 2013 – present: Associate Professor of Instruction, Department of Chemistry,
Northwestern University

Sept. 2008 – present: Director of Undergraduate Studies, Department of Chemistry,
Northwestern University

Sept. 2008 – Sept. 2013: Distinguished Senior Lecturer, Department of Chemistry,
Northwestern University

Sept. 1998 – Aug. 2008: Senior Lecturer, Department of Chemistry, Northwestern
University

Sept. 1995 - 2006: Director, Analytical Services Laboratory, Northwestern University

Sept. 1990 - Aug. 1998: Lecturer, Dept. of Chemistry, Northwestern University

Summers 1992-94: Faculty Research Participant, Argonne National Laboratory

Sept. 1987-Aug.1990: Research Associate, Dept. of Chemistry, Brookhaven National
Laboratory, Advisor: Trevor J. Sears

July 1985-Aug. 1987: NSERC Industrial Research Fellow with Ontario Hydro, Toronto,
Ontario, Canada.

FUNDED TEACHING PROPOSALS

“ChemEXCEL: A summer academic and leadership program for students from underrepresented groups”,
Greg Beitel, Luke Flores, Greg Light, Stanley Lo, Fred Northrup, The Alumnae of Northwestern
University, \$11,147 requested, \$5,900 funded, 2013, extended to 2014.

“Department of Chemistry Computer Laboratory”, Fred Northrup, Northwestern University Hewlett Fund, 2013, \$8,058 requested and funded.

“Department of Chemistry Computer Laboratory”, Fred Northrup and Andy Ott, The Alumnae of Northwestern University, \$20,170 requested, \$10,488 funded, 2012.

“Correlation of Student Performance in Freshman Chemistry and Math Courses”, Fred Northrup, Shelby Hatch and Martina Bode, Searle Center for Teaching Excellence, \$1200 funded, 2010.

“Laser Measurements in the Undergraduate Laboratory”, Frederick J. Northrup, WCAS Klopsteg Fund, \$20,035 requested, \$11,667 funded, 2007.

“Fluorescence and Phosphorescence Spectroscopy in the Undergraduate Laboratory”, Frederick J. Northrup; Camille and Henry Dreyfus Special Grant Program in the Chemical Sciences, \$15,000 funded, 1993.

“Laser Spectroscopy in the Undergraduate Laboratory”, Frederick J. Northrup and Martin F. Jarrold, Hewlett Fund for Curriculum Innovation, \$8000 funded, 1993.

FUNDED ANALYTICAL SERVICES LABORATORY PROPOSALS (P.I. or written as Director of ASL, but could not serve as P.I.)

“Acquisition of a Nano-flow HPLC for Proteomics Mass Spectrometry Service in the ASL”, F.J. Northrup, Northwestern University Shared Facilities Fund, \$35,000 funded, 2006.

“Acquisition of a 400 MHz Solid State NMR Spectrometer”, National Science Foundation Major Research Instrumentation Program, T.J. Marks, J.T. Hupp, H.H. Kung, S.T. Nguyen, and R.Q. Snurr, \$468,376 funded, 2005-06.

“Replacement of the Probe for a 500 MHz NMR Spectrometer”, F.J. Northrup, Northwestern University Shared Facilities Fund”, \$14,900 funded, 2005.

“Data Acquisition System Upgrades for ASL Instruments”, F.J. Northrup, Northwestern University Shared Facilities Committee, \$16,100 funded, 2004.

“Hardware and Software Accessories for Biomolecule Mass Spectrometry Capabilities in the Analytical Services Laboratory”, F.J. Northrup, Northwestern University Shared Facilities Committee, \$31,383 funded, 2004.

“Acquisition of an improved low temperature accessory for X-ray crystallography”, F.J. Northrup, Northwestern University Shared Facilities Committee, \$13,350 funded, 2002.

“Acquisition of a New 4-Nucleus Autoswitching Probe for the Gemini 2000 NMR Spectrometer in the ASL”, F.J. Northrup, Northwestern University Shared Facilities Committee, \$24,970 funded, 2003.

“A Modern Database System for Shared Facility Scheduling, Access, and Revenue and Expenses Tracking.”, F.J. Northrup and K. Spiegel, Northwestern University Shared Facilities Committee, \$47,000 funded, 2002.

“Acquisition of a New Broadband Probe for the INOVA 400 NMR Spectrometer in the ASL”, F.J. Northrup, Shared Facilities Fund in the Office of the Vice President for Research, \$21,700 funded, 2001.

"Automation of Some Mass Spectrometry Analyses in the Analytical Services Laboratory", F.J. Northrup, Shared Facilities Fund in the Office of the Vice President for Research, \$20,942 funded, 2000.

"Acquisition of a High Temperature Gel Permeation Chromatograph with Light Scattering Detector", Tobin J. Marks, SonBinh Nguyen and Samuel I. Stupp, Major Research Instrumentation program of the NSF, \$136,912 funded, 1999.

"NMR Spectral Prediction Software and Databases for the Analytical Services Laboratory.", F.J. Northrup, Shared Facilities Fund in the Office of the Vice President for Research, \$29,700 funded, 1998.

"Upgrade of a 600 MHz NMR Spectrometer for Structural Biology.", T.V. O' Halloran, Shared Instrument Program of the NIH for \$494,073 \$261.246 funded, 1999.

"Acquisition of a 500 MHz NMR Spectrometer for Chemical Research", J.B. Lambert, H.A. Godwin, and C.A. Mirkin Major Research Instrumentation program of the NSF, \$450,000 funded, 1998.

"Exact Mass Capability for the ASL Electrospray Triple Quadrupole Mass Spectrometer.", F.J. Northrup, Shared Facilities Fund in the Office of the Vice President for Research, \$23,920 funded, 1998.

"Acquisition of an X-ray Diffractometer with CCD Detector", J.A. Ibers , NSF Chemistry Research Instrumentation and Facilities program, \$210,000 funded, 1997.

"Waveform generator and software upgrade for the ASL NMR facility", F.J. Northrup, Shared Facilities Fund in the Office of the Vice President for Research, \$18,500 funded, 1997.

"Data system upgrade for the ASL mass spectrometry facility.", F.J. Northrup, Shared Facilities Fund in the Office of the Vice President for Research, \$20,000 funded, 1996.

PUBLICATIONS:

J.W. Hepburn, D. Klimek, K. Liu, R.G. Macdonald, H.R. Mayne, F.J. Northrup and J.C. Polanyi, "Isotope Effects in Abstraction and Exchange Reactions H + H'Br.", *International Journal of Chemical Kinetics* 13, 845-854 (1981).

J.W. Hepburn, D. Klimek, K. Liu, R.G. Macdonald, F.J. Northrup and J.C. Polanyi, "Reactive Cross Section as a Function of Reagent Energy. II. H(D) + HBr(DBr) → H₂(HD, D₂) + Br.", *Journal of Chemical Physics* 74, 6226-6241 (1981).

J.W. Hepburn, K. Liu, R.G. Macdonald, F.J. Northrup and J.C. Polanyi, "Dynamics of Nonadiabatic Reactions. I. F(²P_{3/2}, ²P_{1/2}) + HBr(DBr) → HF(DF) + Br(²P_{3/2}, ²P_{1/2}).", *Journal of Chemical Physics* 75, 3353-3364 (1981).

J.W. Hepburn, F.J. Northrup, G.L. Ogram, J.C. Polanyi and J.M. Williamson, "Rotationally Inelastic Scattering From Surfaces. CO(g) + LiF(001).", *Chemical Physics Letters* 85, 127-130 (1982).

J.W. Hepburn, K. Honma, M. Keil, F.J. Northrup, G.L. Ogram, J.C. Polanyi, J.M. Williamson and R.J. Wolf, "State-Selected Studies of Gas-Surface Encounters", IUPAC *Frontiers of Chemistry* (Pergamon, Oxford, 1982) pp.359-369.

F.J. Northrup, J.C. Polanyi, S.C. Wallace and J.M. Williamson, "VUV Laser-Induced Fluorescence of Molecular Hydrogen.", *Chemical Physical Letters* 105, 34 (1984).

- G.L. Ogram, F.J. Northrup and G.C. Edwards, "Fast Time Response Tunable Diode Laser Measurements of Atmospheric Trace Gases for Eddy Correlation.", *Journal of Atmospheric and Oceanic Technology* 5, 521-527 (1988).
- G.C. Edwards, F.J. Northrup and G.W. Thurtle, "The Investigation of Dry Deposition Processes. Phase II - The Measurement of Dry Deposition Fluxes.", Canadian Electrical Association Report No. 187 G 294A (1988).
- F.J. Northrup, "NO_x Formation and Control During Fossil-Fuel Combustion.", Ontario Hydro Research Division Internal Report No. 88-213-K (1988).
- A. Tempelmann, F.J. Northrup and A. Kalvins, "The Selective Catalytic Reduction of Nitric Oxide Using Supported Metal Oxides.", Ontario Hydro Research Division Report No. C89-9-K (1989).
- F.J. Northrup and T.J. Sears, "Dynamics of NCS Formation from Photolysis of RNCS.", *Advances in Laser Science-IV. Proceedings of the Fourth International Laser Science Conference, Atlanta, 1988.*
- F.J. Northrup and T.J. Sears, "Laser-Induced Fluorescence Spectroscopy of NCS in a Free Jet Expansion.", *Journal of Chemical Physics* 91, 762 (1989).
- F.J. Northrup and T.J. Sears, "Observation of Stimulated Emission Pumping Spectra of Jet-Cooled NCS and C₃.", *Chemical Physics Letters* 159, 421-425 (1989).
- F.J. Northrup and T.J. Sears, "Photodissociation of RNCS and RSCN (R = H, CH₃, C₂H₅) at 248 and 193 nm: Evidence for an Excited State Isomerization and Energy Deposition in the NCS Product.", *Journal of Chemical Physics* 93, 2337-2345 (1990).
- F.J. Northrup and T.J. Sears, "Photodissociation of RNCS and RSCN (R = H, CH₃, C₂H₅) at 248 nm and 193 nm: CN Product Energy Distributions.", *Journal of Chemical Physics* 93, 2346-2356 (1990).
- F.J. Northrup and T.J. Sears, "Stimulated Emission Pumping Spectroscopy of Jet-Cooled C₃: Pure Bending Levels and Bend - Symmetric Stretch Combination Levels of X¹Σ_g⁺.", *Journal of the Optical Society of America B* 7, 1924-1934 (1990).
- F.J. Northrup and T.J. Sears, "Renner-Teller, Spin-Orbit and Fermi-Resonance Interactions in X²Π NCS Investigated by LIF Spectroscopy.", *Molecular Physics* 71, 45-64 (1990).
- F.J. Northrup, T.J. Sears and E.A. Rohlfing, "A Semi-Rigid Bender Analysis of the Bending Vibrational Levels in X¹Σ_g⁺ C₃.", *Journal of Molecular Spectroscopy* 145, 74-88 (1991).
- F.J. Northrup, Ming Wu and Trevor J. Sears, "Measurement of (00v₃) Levels in X²Π NCO by Stimulated Emission Pumping Spectroscopy.", *Journal of Chemical Physics* 96, 7218-7228 (1992).
- Ming Wu, F.J. Northrup and Trevor J. Sears, "A Study of Renner-Teller, Spin-Orbit and Fermi-resonance Interactions in X²Π(v₁v₂0) Levels of NCO.", *Journal of Chemical Physics* 97, 4583-4595 (1992).
- F.J. Northrup and Trevor J. Sears, "Stimulated Emission Pumping: Applications to Highly Vibrationally Excited Transient Molecules.", *Annual Review of Physical Chemistry* 43, 127-152 (1992).

- G.A. Bethardy, F.J. Northrup and R. Glen Macdonald, "Time-Resolved Infrared Absorption Studies Applied to the Study of Radical Plus Molecule Reactions.", SPIE Proceedings Series Volume 2124, Laser Techniques for State-Selected and State to State Chemistry II (Jan. 27-29, 1994).
- J. Almlof, P. Jensen, F.J. Northrup, C.M. Rohlfiing, E.A. Rohlfiing and T.J. Sears, "Comment on 'The v_1+v_3 combination mode of C_3 in Ar and Kr matrices: Evidence for a bent structure [J. Chem. Phys. 99, 7371 (1993)]'", Journal of Chemical Physics 101, 5413 (1994).
- G.A. Bethardy, F.J. Northrup and R. Glen Macdonald, "The Initial Vibrational State Distribution of HCN $X^1\Sigma^+(v_1,0,v_3)$ from the reaction $CN(^2\Sigma^+) + C_2H_6 \rightarrow HCN + C_2H_5$.", Journal of Chemical Physics 102, 7966 (1995).
- G.A. Bethardy, F.J. Northrup and R. Glen Macdonald, "The initial vibrational state distribution of HCN $X^1\Sigma^+(v_1,0,v_3)$ from the reaction $CN(^2\Sigma^+) + CH_4 \rightarrow HCN + CH_3$ ", Journal of Chemical Physics 105, 4533 (1996) .
- Mitch Jacoby, F.J. Northrup, P.C. Stair, E. Weitz and L.D. Marks, "An investigation of the ESD O/O+ ratio from V_2O_5 and oxidized V.", Applied Surface Science 108, 23 (1997).
- F.J. Northrup, G.A. Bethardy and R. Glen Macdonald, "Infrared absorption spectroscopy of HNC in the 2.6 to 3.1 micron region.", Journal of Molecular Spectroscopy 186, 349-362 (1997).
- G.A. Bethardy, F.J. Northrup, G.He, I. Tokue and R. Glen Macdonald, "Initial vibrational level distribution of HCN ($X^1\Sigma^+ v_1,0v_3$) from the $CN(X^2\Sigma^+) + H_2 \rightarrow HCN + H$ reaction.", Journal of Chemical Physics 109, 4224-36 (1998).

WORK IN PROGRESS FOR PUBLICATION:

- Nevette A. Bailey, F.J Northrup, Owen P. Priest and Charlotte L. Stern, "N-[(4-chlorophenyl)methylene]-Benzenamine", paper in preparation for submission to Acta Crystallographica E.
- Nevette A. Bailey, F.J Northrup, Owen P. Priest and Charlotte L. Stern, "N-[(4-bromophenyl)methylene]-Benzenamine", paper in preparation for submission to Acta Crystallographica E.
- Shelby L. Hatch, F.J. Northrup, Omar Farha, "Synthesis and Characterization of MOFs in the Undergraduate Laboratory", paper in presentation for submission to the Journal of Chemical Education.
- Raul Chavez, Isabel Abbott, F. J. Northrup, and Christine Rabenold, "Heavy Metal Leaching from Pottery Glazes Containing Barium", paper in preparation.

RECENT PRESENTATIONS:

- "Safety of Barium-Containing Glazes for Functional Pottery", **Raul Chavez**, Alex Decorrevont, and F.J. Northrup, Northwestern University Undergraduate Research Symposium, June 2014.
- "Safety of Barium-Containing Glazes for Functional Pottery", **Raul Chavez**, Alex Decorrevont and F.J. Northrup, Chicago Area Undergraduate Research Symposium (CAURS), April 2014.
- "Safety of Barium-Containing Glazes for Functional Pottery", **Raul Chavez**, F.J. Northrup and Christine Rabenold, Northwestern University Undergraduate Research Symposium, June 2013.

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