N. Scott **Lynn Jr.**

Chemical Engineer · Research Scientist

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Education

Ph.D., Chemical Engineering *August 2009*
Colorado State University (Advisor: David S. Dandy) *Fort Collins, CO, USA*

B.A., Chemistry (Biochemistry minor) *August 1999*
University of Colorado *Boulder, CO, USA*

Experience

Research Scientist *December 2019 - present*
Institute of Physics, Academy of Sciences of the Czech Republic *Prague, Czech Republic*

- Advanced microfluidics for biosensors, SPR- and QCM-based.
- Development of additive manufacturing methods (3D printing) for microfluidic purposes.
- Development of complex microfluidic architectures for single cell biological analysis.

Research Scientist *January 2012 - July 2019*
Institute of Photonics and Electronics, Academy of Sciences of the Czech Republic *Prague, Czech Republic*

- Developed the microfluidics program within the division of Optical Biosensors: numerical and experimental focus.
- Designed advanced and reusable multichannel microfluidic flow cells for plasmonic sensors.
- Design of biosensors for the detection of various biological analytes. Development of methods for advanced biomolecular analysis.
- Development of advanced biosensors based on photonic nanostructures: $10\times$ increase in performance over previous SOA.
- Contributed to funding of domestic (GAČR Center of Excellence) and international (EU Horizon 2020) multi-disciplinary research efforts.
- Grad student (10+) and Postdoc mentoring. Internal guidance and peer review led to publication of over 50 manuscripts.
- Responsible for acquisition and maintenance of multiple scientific instruments (> 5.000.000 CZK)

Scientific Consultant *January 2009 - October 2011*
Multiple Companies *Fort Collins, CO, USA*

- Development of robust algorithms for automated analysis of capillary electrophoretic sensorgrams (Advanced MicroLabs, LLC.).
- Evaluation of enzyme-based rapid toxicity tests for drinking water (US Army, Center for Environmental Health Research).
- CFD analysis of rapid, point-of-care HIV diagnostic device (mBio Diagnostics, Inc.)

Postdoctoral Fellow *August 2009 - October 2011*
Colorado State University, Department of Chemical Engineering *Fort Collins, CO, USA*

- Contributed to a multi-disciplinary project for the rapid detection of disease markers using a disposable CMOS chip.
- Development of highly controllable, long-term, steady-state microfluidic passive pumping techniques.
- Implementation of novel immunoassay protocols for the detection of tuberculosis-reactive antibodies.
- Mentoring of Graduate (2) and Undergraduate students (4)

Ph.D. Dissertation Research *October 2003 - July 2009*
Colorado State University, Department of Chemical Engineering *Fort Collins, CO, USA*

- Numerical work: utilization of Computational Fluid Dynamics for the optimization of microfluidic mixing strategies
  - Utilization of several commercial packages for solution of velocity, pressure, and solute concentration fields (Fluent, COMSOL).
  - Development of custom 2D finite element methods for solution to multi-physics microfluidic problems (C/C++, Matlab).
- Experimental work: design, fabrication, and optimization of complex microfluidic systems.
  - Designed microfabrication methodologies for both clean room (class 1000) and standard laboratory environments.
  - Fabrication of multi-layer microfluidic systems aligned to metal microstructures.
  - Designed protocols regarding bioreceptor immobilization for novel heterogeneous immunoassays.

Manager of Technical Operations *July 2000 - December 2002*
Blue Star Sustainable Technologies (Venture Startup) *Arvada, CO, USA*

- Contributed to the design of a 2 barrel/day Fischer-Tropsch pilot plant for the synthesis of high-quality liquid fuels from natural gas.
- Managed a team of 8 scientists, engineers, and laborers for pilot plant construction and operation.
- Designed high pressure/temperature reactors for both partial oxidation and Fischer-Tropsch reactors.
- Contributed to the oversight of a venture capital budget exceeding $2.000.000 USD.

Research Technician *August 1999 - July 2000*
Eltron Research & Development, Inc. *Gunbarrel, CO, USA*

- Developed homogeneous benchtop catalytic systems for the direct oxidation of benzene to phenol.
- Developed benchtop heterogeneous catalytic reactors for the partial oxidation of diesel fuel to synthesis gas.

Programming, Software, and Language Expertise

Programming	Matlab, C/C++, LaTeX; Python, Javascript (beginner)
CFD Software	COMSOL, ANSYS/Fluent
Graphic Design	CorelDraw, Illustrator, Photoshop, InDesign, Blender
Additional Software	Microsoft Office, Endnote, Origin, Mathcad
Languages	English (native), Czech (B2/C1), German (A1)

Technical Expertise

Experimental

Lithography	Mask Aligner, Direct Write Laser, and Transparency Mask based. Mask Design. Multi-layer processes
Microfluidic Fabrication	Replication (PDMS), Embossing (polycarbonate), Wet Etching (glass), Direct Fabrication
Microfluidic Operation	Mixing, Pumping, Separation, Reaction
Other Microfabrication	Vacuum Evaporation, Plasma and RIE Etching, Lift-off
Characterization	SEM, Fluorescent (Confocal) Microscopy, AFM, Optical and Stylus Profilometry
Biosensing	SPR, Nanoplasmonic, and Electrochemical Sensors, Affinity Interactions, Kinetic Analysis
Reactor Design	Homogeneous CSTR Catalysis, Heterogeneous Catalysis: partial oxidation, Fischer-Tropsch chemistries

Numerical and Theoretical

CFD	Preprocessing, numerical simulation, post-processing. 3D, 2D, 2D axisymmetric domains
Numerical Analysis	Finite element, volume, and difference methods. Signal processing. Inverse problems Nonlinear regression, Statistical analysis
Transport Phenomena	Mass, heat, and momentum transfer, multiphase fluid phenomena, evaporation driven systems

Awards and Scholarship

2007	**Outstanding Graduate Research Recipient**	*Department of Chemical Engineering, CSU*
2006	**Outstanding Graduate Teaching Assistant Recipient**	*Department of Chemical Engineering, CSU*
2006, 2007	**Shrake-Culler Scholarship**	*College of Engineering, CSU*
2005, 2006	**Fast Track to Work Scholarship**	*College of Engineering, CSU*
2004	**National Science Foundation CSEM Scholarship**	*National Science Foundation*

Teaching Experience

Instructor *Fall 2007*

FLUID DYNAMICS (3RD YEAR UNDERGRADUATE, 25 STUDENTS) *Department of Chemical Engineering, CSU*

- Developed syllabus and lecture notes. Gave lectures. Wrote and graded all homework sets and exams.

Laboratory Instructor *Fall 2005, 2006*

NUMERICAL ANALYSIS FOR CHEMICAL ENGINEERING (25-30 STUDENTS) *Department of Chemical Engineering, CSU*

- Gave lectures in a computer laboratory environment. Graded homework assignments.

Teaching Assistant *2003-2006*

VARIOUS COURSES *Department of Chemical Engineering, CSU*

- Thermodynamics (Spring 2005, 2006)
- Material and Energy Balances (Fall 2004)
- Chemical Reactor Design (Spring 2003, 2004)

Selected Presentations

- (Invited) "*Nanoplasmonic Biosensing: Architectural Design and Analyte Transport*" SPIE 2019, Prague
- "*Nanoplasmonic Biosensing: Consideration of Analyte Transport*" 2nd European Biosensor Symposium 2019, Florence
- (Invited) "*Nanoplasmonic Biosensors: A Search for the Optimum Balance Between Optical Performance and Analyte Transport*" SelectBIO Lab-on-a-Chip and Microfluidics 2017, Munich
- "*Mass Transfer and Sensitivity of Biosensors Based on Nanoparticle Arrays*" Biosensors 2016, Gothenburg
- "*Biosensing with Nanoparticle Arrays: Effect of NP Size, Shape, and Packing Density on Sensitivity*" Europtrode 2016, Graz
- "*Enhancement of Affinity Biosensors using the Staggered Herringbone Mixer*" Europtrode 2014, Athens
- "*High Resolution Microfluidic Sampling in Ex-Vivo Biological Tissues*" MicroTAS 2011, Seattle
- "*Microfluidic Passive Pumping using Coupled Capillary/Evaporation Effects*", AICHE Annual Meeting 2009, Nashville

Publications

Peer Reviewed

19. **N.S. Lynn Jr**, T. Špringer, J. Slabý, B. Špačková, G. Michaela, M. L. Ermini, and J. Homola, "Analyte transport to micro- and nano-plasmonic structures," *Lab on a Chip*, vol. 19, pp. 4117–4127, 2019. Impact Factor (2018): 6.914
18. L. Chrastinová, O. Pastva, M. Bocková, **N.S. Lynn Jr**, P. Šácha, M. Hubálek, J. Suttnar, R. Kotlín, J. Štikarová, A. Hlaváčková, *et al.*, "A new approach for the diagnosis of myelodysplastic syndrome subtypes based on protein interaction analysis," *Scientific reports*, vol. 9, no. 1, pp. 1–10, 2019. Impact Factor (2018): 4.011
17. H. Šípová-Jungová, L. Jurgová, K. Mrkvová, **N.S. Lynn Jr**, B. Špačková, and J. Homola, "Biomolecular charges influence the response of surface plasmon resonance biosensors through electronic and ionic mechanisms," *Biosensors and Bioelectronics*, vol. 126, pp. 365–372, 2019. Impact Factor (2018): 9.518
16. **N.S. Lynn Jr** and J. Homola, "Microfluidic analyte transport to nanorods for photonic and electrochemical sensing applications," *Chemistry–A European Journal*, vol. 24, no. 46, pp. 12031–12036, 2018. Impact Factor (2018): 5.16
15. B. Špačková, **N.S. Lynn Jr**, J. Slabý, H. Šípová, and J. Homola, "A route to superior performance of a nanoplasmonic biosensor: Consideration of both photonic and mass transport aspects," *ACS Photonics*, vol. 5, no. 3, pp. 1019–1025, 2018. Impact Factor (2018): 7.143
14. **N.S. Lynn Jr** and J. Homola, "(bio) sensing using nanoparticle arrays: On the effect of analyte transport on sensitivity," *Analytical chemistry*, vol. 88, no. 24, pp. 12145–12151, 2016. Impact Factor (2016): 6.320
13. H. Vaisocherová-Lísalová, I. Víšová, M. L. Ermini, T. Špringer, X. C. Song, J. Mrázek, J. Lamačová, **N.S. Lynn Jr**, P. Šedivák, and J. Homola, "Low-fouling surface plasmon resonance biosensor for multi-step detection of foodborne bacterial pathogens in complex food samples," *Biosensors and Bioelectronics*, vol. 80, pp. 84–90, 2016. Impact Factor (2016): 7.780
12. **N.S. Lynn Jr**, M. Bocková, P. Adam, and J. Homola, "Biosensor enhancement using grooved micromixers: part ii, experimental studies," *Analytical chemistry*, vol. 87, no. 11, pp. 5524–5530, 2015. Impact Factor (2015): 5.886
11. **N.S. Lynn Jr** and J. Homola, "Biosensor enhancement using grooved micromixers: Part i, numerical studies," *Analytical chemistry*, vol. 87, no. 11, pp. 5516–5523, 2015. Impact Factor (2015): 5.886
10. **N.S. Lynn Jr**, J.-I. Martínez-López, M. Bocková, P. Adam, V. Coello, H. R. Siller, and J. Homola, "Biosensing enhancement using passive mixing structures for microarray-based sensors," *Biosensors and Bioelectronics*, vol. 54, pp. 506–514, 2014. Impact Factor (2014): 6.409
9. **N.S. Lynn Jr**, H. Šípová, P. Adam, and J. Homola, "Enhancement of affinity-based biosensors: effect of sensing chamber geometry on sensitivity," *Lab on a Chip*, vol. 13, no. 7, pp. 1413–1421, 2013. Impact Factor (2013): 5.748
8. M. M. Mensack, J. B. Wydallis, **N.S. Lynn Jr**, D. S. Dandy, and C. S. Henry, "Spatially resolved electrochemical sensing of chemical gradients," *Lab on a Chip*, vol. 13, no. 2, pp. 208–211, 2013. Impact Factor (2013): 5.748
7. R. Yan, **N.S. Lynn Jr**, L. C. Kingry, Z. Yi, T. Erickson, R. A. Slayden, D. S. Dandy, and K. L. Lear, "Detection of virus-like nanoparticles via scattering using a chip-scale optical biosensor," *Applied Physics Letters*, vol. 101, no. 16, p. 161111, 2012. Impact Factor (2012): 3.794
6. **N.S. Lynn Jr**, S. Tobet, C. S. Henry, and D. S. Dandy, "Mapping spatiotemporal molecular distributions using a microfluidic array," *Analytical chemistry*, vol. 84, no. 3, pp. 1360–1366, 2012. Impact Factor (2012): 5.856
5. R. Yan, **N.S. Lynn Jr**, L. C. Kingry, Z. Yi, R. A. Slayden, D. S. Dandy, and K. L. Lear, "Waveguide biosensor with integrated detector array for tuberculosis testing," *Applied Physics Letters*, vol. 98, no. 1, p. 013702, 2011. Impact Factor (2011): 3.844
4. **N.S. Lynn Jr** and D. S. Dandy, "Passive microfluidic pumping using coupled capillary/evaporation effects," *Lab on a Chip*, vol. 9, no. 23, pp. 3422–3429, 2009. Impact Factor (2009): 6.306
3. **N.S. Lynn Jr**, C. S. Henry, and D. S. Dandy, "Evaporation from microreservoirs," *Lab on a Chip*, vol. 9, no. 12, pp. 1780–1788, 2009. Impact Factor (2009): 6.306
2. **N.S. Lynn Jr**, C. S. Henry, and D. S. Dandy, "Microfluidic mixing via transverse electrokinetic effects in a planar microchannel," *Microfluidics and Nanofluidics*, vol. 5, no. 4, pp. 493–505, 2008. Impact Factor (2008): 3.314
1. **N.S. Lynn Jr** and D. S. Dandy, "Geometrical optimization of helical flow in grooved micromixers," *Lab on a Chip*, vol. 7, no. 5, pp. 580–587, 2007. Impact Factor (2007): 5.086

Book Chapters

1. **N.S. Lynn Jr**, "Microfluidic mixing for biosensors," in *Miniature Fluidic Devices for Rapid Biological Detection*, pp. 69–103, Springer, 2018

Conference Papers

4. B. Spackova, **N.S. Lynn Jr**, J. Homola, P. Kwiecien, and I. Richter, "Consideration of photonic and mass-transfer aspects on the performance of a biosensor based on localized surface plasmons on an array of gold cylinders," in *Sensors, 2012 IEEE*, pp. 1–4, IEEE, 2012
3. M. M. Mensack, J. B. Wydallis, **N.S. Lynn Jr**, D. S. Dandy, and C. S. Henry, "Providing spatial and temporal distributions of biomarkers using microfluidic electrochemical biosensors," in *ABSTRACTS OF PAPERS OF THE AMERICAN CHEMICAL SOCIETY*, vol. 243, AMER CHEMICAL SOC 1155 16TH ST, NW, WASHINGTON, DC 20036 USA, 2012
2. R. Yan, **N.S. Lynn Jr**, L. C. Kingry, R. A. Slayden, D. S. Dandy, and K. L. Lear, "Demonstration of nanoparticle detection using a local evanescent array coupled biosensor," in *Photonics Society, 2010 23rd Annual Meeting of the IEEE*, pp. 214–215, IEEE, 2010
1. R. Yan, **N.S. Lynn Jr**, L. C. Kingry, D. S. Dandy, R. A. Slayden, and K. L. Lear, "Waveguide biosensor with integrated photodetector array for tuberculosis serology," in *Conference on Lasers and Electro-Optics: Applications*, p. AMC4, Optical Society of America, 2010