Curriculum Vitae
Ludwig Carlos Nitsche, Ph.D.

Education.

NATO Postdoctoral Fellowship (1989-1990), Department of Applied Mathematics and Theoretical Physics (DAMTP), University of Cambridge, UK. Advisor: Professor E. J. Hinch.

Ph.D. in Chemical Engineering (1989), Massachusetts Institute of Technology. Advisor: Professor Howard Brenner. Thesis title: "Multiphase Flow Through Spatially Periodic Models of Porous Media."

B.Ch.E. (With High Distinction, 1984) and B.Math (With High Distinction, 1984), University of Minnesota. Baccalaureate grade-point average: 3.98 / 4.00.

Languages.

English: mother tongue
Spanish: functional to fluent
German: fluent

Academic and administrative appointments since the PhD.

8/2019 – Current	Associate Dean of the School of Engineering and Applied Sciences (SEAS) and Professor of Mechanical Engineering, University of the District of Columbia (UDC)
8/2015 – 8/2019	Associate Dean for Undergraduate Affairs, College of Engineering, University of Illinois at Chicago (UIC)
6/2014 – 8/2015	Interim Head, Department of Chemical Engineering, UIC
8/2005 – 5/2014	Director of Undergraduate Studies, Department of Chemical Engineering, UIC
9/1996 – Current	Associate Professor of Chemical Engineering, UIC
9/1991 – 8/1996	Assistant Professor of Chemical Engineering, UIC
1/1990 – 8/1991	Visiting Assistant Professor of Chemical Engineering, UIC
9/1989 – 12/1990	NSF-NATO Postdoctoral Fellow, DAMTP, University of Cambridge, UK
6/1989 – 8/1989	Postdoctoral Associate, Department of Chemical Engineering, MIT

Honors and awards.
(9) UIC Award for Excellence in Teaching, 2013-2014.
(8) UIC College of Engineering Harold A. Simon Award for Excellence in Teaching, 2011-2012.
(7) UIC College of Engineering 2008 Faculty Teaching Award.
(6) UIC CETL 2007 Teaching Recognition Program Award.
(5) UIC College of Engineering 2006 Faculty Teaching Award.
(4) USIA Fulbright Senior Scholar Program, Award #9498 (Austria, Research, 10/1999 – 1/2000).
(3) National Science Foundation Young Investigator (NYI) Award, 1994-1999.
(2) NSF-NATO Postdoctoral Fellowship, awarded February 1989.
(1) NSF Graduate Fellowship Award, 1984-1987.

Courses taught at UDC.

MECH 321 Sophomore Fluid Mechanics

Courses taught at UIC. Asterisk (*) indicates that LCN was originator of new course.

ChE 201	Sophomore	Introduction to Thermodynamics
ChE 205*	Sophomore	Computational Methods in Chemical Engineering
ChE 301	Junior	Chemical Engineering Thermodynamics
ChE 311	Junior	Transport Phenomena I (Fluid mechanics)
ChE 312	Junior	Transport Phenomena II (Heat and Mass Transfer)
ChE 341	Senior	Chemical Process Control
ChE 397	Senior	Senior Design II
ChE 410	Graduate	Transport Phenomena
ChE 413*	Graduate	Introduction to Flow in Porous media
ChE 431	Graduate	Numerical Methods in Chemical Engineering
ChE 433*	Graduate	Process Simulation With Aspen Plus
ChE 445	Graduate	Mathematical Methods in Chemical Engineering
ChE 512*	Graduate	Microhydrodynamics, Diffusion and Membrane Transport

Articles in preparation.

[35] R. G. Henriquez Rivera and L. C. Nitsche, "Fourier extension and interpolation of solenoidal vector fields with radial basis functions." Manuscript in preparation for submission to *J. Comput. Phys.*

[34] L. C. Nitsche, G. B. Kasting and J. M. Nitsche, "Physics-based algorithms for the diffusion velocity method in multiphase systems: Adaptive range finding, boundary corrections and particle redistribution." Manuscript in preparation for submission to *J. Comput. Phys*

Publications in refereed journals

[33] A. Aljehania, L. C. Nitsche, S. Al-Hallaj (2020), Numerical modeling of transient heat transfer in a phase change composite thermal energy storage (PCC-TES) system for air conditioning applications, *Applied Thermal Engineering*, 164, 114522. DOI: 10.1016/j.applthermaleng.2019.114522

[32] I. L. Molnar, E. Pensini, Md A. Asad, C. A. Mitchell, L. C. Nitsche, L. J. Pyrak-Nolte, G. L. Miño and M. M. Krol (2019), Colloid Transport in Porous Media: A Review of Classical Mechanics and Emerging Topics, *Transp. Porous Media*, 130, 129-156. DOI: 10.1007/s11242-019-01270-6

[31] L. C. Nitsche, J. M. Nitsche and G. B. Kasting (2019), Microscopic Models of Drug/Chemical Diffusion Through the Skin Barrier: Effects of Diffusional Anisotropy of the Intercellular Lipid, *J. Pharm. Sci.*, 108, 1692-1712. DOI: 10.1016/j.xphs.2018.11.014

[30] P. Leon Plata, Y. Liu and L. C. Nitsche (2018), Interaction of Multiple Drops and Formation of Toroidal-Spiral Particles, *Phys. Rev. Fluids,* 3, 093601.
DOI: 10.1103/PhysRevFluids.3.093601

[29] A. Aljehani, S. A. K. Razackc, L. Nitsche, S. Al-Hallaj (2018), Design and optimization of a hybrid air conditioning system with thermal energy storage using phase change composite, *Energy Conversion & Management*, 169, 404–418. DOI: 10.1016/j.enconman.2018.05.040

[28] L. C. Nitsche and B.A. Bernal (2018), Stokes flow singularity at a corner joining solid and porous walls at arbitrary angle, *J. Eng. Math.,* 108, 1–23. DOI: 10.1007/s10665-017-9901-2

[27] V. Sharma, M. Köllmer, M. Szymusiak, L. C. Nitsche, R. A. Gemeinhart and Y. Liu (2014), Toroidal Spiral Particles for Codelivery of Anti-VEGFR-2 Antibody and Irinotecan: A Potential Implant to Hinder Recurrence of Glioblastoma Multiforme, *Biomacomolecules*, 15, 756–762. DOI: 10.1021/bm401550r

[26] L. C. Nitsche and P. Parthasarathi (2012), Stokes flow singularity at the junction between impermeable and porous walls. *J. Fluid Mech.*, 713, 183–215. DOI:10.1017/jfm.2012.454

[25] M. Szymusiak M, V. Sharma V, L. C. Nitsche and Y. Liu (2012), Interaction of sedimenting drops in miscible solution – formation of heterogeneous toroidal-spiral particles. *Soft Matter*, 8, 7556–7559 (2012). DOI: 10.1039/c2sm25928a

[24] V. Sharma, M. Szymusiak, H. Shen, L. C. Nitsche, and Y. Liu (2012), Formation of polymeric Toroidal-spiral particles, *Langmuir*, 28, 729–735. DOI: 10.1021/la203338v

[23] Y. Lei, J. Jelic, L. C. Nitsche, R. Meyer and J. Miller (2011), Effect of Particle Size and Adsorbates on the L3, L2 and L1 X-ray Absorption Near Edge Structure of Supported Pt Nanoparticles, *Topics in Catalysis*, 54, 334–348. DOI 10.1007/s11244-011-9662-5

[22] L. C. Nitsche and P. Parthasarathi (2010), Cubically Regularized Stokeslets for Fast Particle Simulations of Low-Reynolds-Number Drop Flows, *Chem. Eng. Commun.*, 197, 18–38. DOI: 10.1080/00986440903070809

[21] N. S. Parkar, B. S. Akpa, L. C. Nitsche, L. E. Wedgewood, M. S. Sverdlov, O. Chaga and R. D. Minshall (2009), Vesicle formation and Endocytosis: Function, machinery, Mechanisms, and Modeling (Forum Review Article), *Antioxidants & Redox Signaling*, 11, 1301–1312. DOI: 10.1089/ars.2008.2397

[20] L. C. Nitsche (2006), Accurate asymptotic formulas for the transient PDF of a FENE dumbbell in suddenly started uniaxial extension followed by relaxation. *J. Non-Newtonian Fluid Mech.*, 135, 109–116. DOI: 10.1016/j.jnnfm.2006.01.008

[19] L. C. Nitsche, W. Zhang and L. E. Wedgewood (2006), Asymptotic basis of the L-closure for finitely extensible dumbbells in suddenly started uniaxial extension. *J. Non-Newtonian Fluid Mech.*, 133, 14–27. DOI:10.1016/j.jnnfm.2005.10.004

[18] L. C. Nitsche, A. Nguyen and G. Evans (2004), Globally cohesive drops without interfacial tension. *Chem. Phys. Lett.*, 397, 417–421. DOI:10.1016/j.cplett.2004.09.006

[17] S. Murad and L. C. Nitsche (2004), The effect of thickness, pore size and structure of a nanomembrane on the flux and selectivity in reverse osmosis separations: a molecular dynamics study. *Chem. Phys. Lett.*, 397, 211–215. DOI:10.1016/j.cplett.2004.08.106

[16] L. C. Nitsche, G. Machu and W. Meile (2004), Wavelets and fast summations for particle simulations of gravitational flows of miscible drops. *Computers Chem. Eng.*, 28, 1873–1879. DOI :10.1016/j.compchemeng.2004.03.001

[15] L. C. Nitsche and W. Zhang (2002), Atomistic SPH and a link between diffusion and interfacial tension. *AIChE Journal*, 48, 201–211. DOI: 10.1002/aic.690480203

[14] L. C. Nitsche and U. Schaflinger (2001), A swarm of Stokeslets with interfacial tension. *Phys. Fluids.*, 13, 1549–1553. DOI: 10.1063/1.1369124

[13] G. Machu, W. Meile, L. C. Nitsche and U. Schaflinger (2001), Coalescence, torus formation and break-up of sedimenting drops: experiments and computer simulations. *J. Fluid Mech.*, 447, 299–336. DOI: 10.1017/S0022112001005882

[12] L. C. Nitsche and E. J. Hinch (1997), Shear-induced lateral migration of Brownian rigid rods in parabolic channel flow. *J. Fluid Mech.*, 332, 1–21. DOI: 10.1017/S0022112096003369

[11] L. C. Nitsche (1996), Fluctuation-flipping orbits of freely-draining dumbbells in converging-diverging pore flows. *Chem. Eng. Commun.*, 148-150, 593–621. DOI: 10.1080/00986449608936535

[10] L. C. Nitsche, (1996). One-dimensional stretching functions for patched grids, and associated truncation errors in finite-difference calculations. *Commun. Numer. Methods. Eng.*, 12, 303–316. DOI: 10.1002/(SICI)1099-0887(199605)12:5<303

[9] L. C. Nitsche (1996), Cross-stream migration of bead-spring polymers in nonrectilinear pore flows. *AIChE Journal*, 42, 613–622. DOI: 10.1002/aic.690420303

[8] L. C. Nitsche (1995), A singular perturbation analysis of antipolarization dialysis at high aspect ratio. *Ind. Eng. Chem. Research*, 34, 3590–3605. DOI: 10.1021/ie00037a049

[7] L. C. Nitsche and S. Zhuge (1995), Hydrodynamics and selectivity of antipolarization dialysis. *Chem. Eng. Sci.*, 50, 2731–2746. DOI: 10.1016/0009-2509(95)00041-3

[6] P. S. Grassia, E. J. Hinch and L. C. Nitsche (1995), Computer simulations of Brownian motion of complex systems. *J. Fluid Mech.*, 282, 373–403. DOI: 10.1017/S0022112095000176

[5] L. C. Nitsche (1994), Pseudo-sedimentation dialysis: an elliptic transmission problem. *Quart. Appl. Math.*, LII, 83–102. DOI: 10.1090/qam/1262321

[4] E. J. Hinch and L. C. Nitsche (1993), Nonlinear drift interactions between fluctuating colloidal particles: oscillatory and stochastic motions. *J. Fluid Mech.*, 256, 343–401. DOI: 10.1017/S0022112093002812

[3] L. C. Nitsche and H. Brenner (1990), Hydrodynamics of particulate motion in sinusoidal pores via a singularity method. *AIChE Journal*, 36, 1403–1419. DOI: 10.1002/aic.690360913

[2] L. C. Nitsche and H. Brenner (1989), Eulerian kinematics of flow through spatially periodic models of porous media. *Arch. Rational Mech. Anal.*, 107, 225–292. DOI: 10.1007/BF01789610

[1] L. C. Nitsche, J. M. Nitsche and H. Brenner (1988), Existence, uniqueness and regularity of a time-periodic probability density distribution arising in a sedimentation-diffusion problem. *SIAM J. Math. Anal.*, 19, 153–166. DOI: 10.1137/0519012

Other technical publications.

L. C. Nitsche, Appendix: Refined model with sphere-sphere interactions and leading-order wall effects (pp. 358–361) in: R. Zenit and M. L. Hunt, The impulsive motion of a liquid resulting from a particle collision, *J. Fluid Mech.* 375, 345–361 (1998).

L. C. Nitsche, Book Review (Microhydrodynamics: Principles and Selected Applications. By Sangtae Kim and Seppo J. Karrila, Butterworth-Heinemann, Boston, 1991, 507+xxiii pp.), *AIChE Journal,* 40, 739–743 (1994).

L. C. Nitsche, A new lift for centrifugal impellers? *Chem. Eng. Progress,* 87, 73–79 (1991).

Patent issued.

L. C. Nitsche and Y. Liu, Self-assembled toroidal-spiral particles and manufacture and uses thereof, *US Patent 8,852,645,* Issued October 7, 2014.

Grants from external funding agencies.

(17) L. C. Nitsche, Co-PI: "NSF INCLUDES: A Community Centered Approach to Improving STEM Pathways for Underrepresented Students." NSF-SES 1649298. Period: 10/01/2016 – 9/30/2018. Budget: $299,972. (Joint with PI: K. Lawless and co-PIs: J. Abiade, A. Alfonso and D. Wink.)

(16) L. C. Nitsche, Co-PI, "An Integrated Program for Recruitment, Retention, and Graduation of Academically Talented Low Income Engineering Students." NSF-DUE 1644182. Period: 07/01/2017 – 06-30/2022. Budget: $999,096. (Joint grant with PI: H. Darabi and other Co-PIs: R. Revelo Alonso, J. Abiade and P. C. Nelson.)

(15) L. C. Nitsche, Co-PI, "Toroidal-spiral particles (TSPs) for co-delivery of multiple compounds of different sizes." NSF-DMR 1404884. Period: 08/01/2014 – 07/31/2017. Budget: $390,000. (Joint grant with PI: Y. Liu and other Co-PI: R. Gemainhart.)

(14) L. C. Nitsche, PI, "Midwest Thermodynamics and Statistical Mechanics (MTSM) Conference." NSF-CBET . Period: 05/01/2014 – 04/30/2015. Budget: $10,000. (Co-PI: S. Murad.)

(13) L. C. Nitsche, PI, "Collaborative Research: GOALI: Multiscale Theory and Computer Simulation of Skin Absorption Phenomena." NSF-CBET 1335869. Period: September 1, 2013 - August 31, 2016. Budget: $101,229. (Partner investigators and institutions: J. M. Nitsche, State University of New York at Buffalo; G. B. Kasting, University of Cincinnati.)

(12) L. C. Nitsche, PI, "Scholarship Program for Women in Chemical Engineering." NSF-DUE 1060198. Period: September 1, 2012 – August 31, 2017. Budget: $599,766. (Joint grant with Co-PIs: S. Murad, L. E. Wedgewood, P. C. Nelson and G. A. Smith.)

(11) L. C. Nitsche, Co-PI, "EAGER: Preliminary Study on Novel self-assembled Toroidal-Spiral MicroParticles (TSMPs) for sustained release of therapeutic proteins and peptides: theory and experiments." NSF-CBET 1039531. Period: September 1, 2010 – August 31, 2012. Budget: $65,688. (Joint grant with PI: Y. Liu.)

(10) L. C. Nitsche, Co-PI, "GILEE: Establishing a Graduate Interdisciplinary Liberal Engineering Ethics Curriculum." NSF-DBI 0832738. Period: August 15, 2008 – August 14, 2011. Budget: $49,999. (Joint grant with PI: S. Murad and other Co-PI: L. E. Wedgewood.)

(9) L. C. Nitsche, PI, "Aspen Modeling of Thermochemical Cycles." Argonne National Laboratory Subcontract 9J-30282, Period: 05/03/2010 – 9/30/2011. Budget: $33,209. (Joint grant with Co-PI: L. E. Wedgewood.)

(8) L. C. Nitsche, PI, "Evaluation of Three Related Forms of a Copper-Chlorine Thermo-Chemical Cycle for Hydrogen Production." Argonne National Laboratory Subcontract continuation. Period: 9/ 15/2006 – 12/30/2007. Budget: $55,000. (Joint grant with Co-PI: L. E. Wedgewood.)

(7) L. C. Nitsche, PI, "Evaluation of Three Related Forms of a Copper-Chlorine Thermochemical Cycle for Hydrogen Production." Argonne National Laboratory Subcontract 6F-00251. Period: 05/ 15/2006 – 09/15/2006. Budget: $42,000. (Joint grant with Co-PI: L. E. Wedgewood.)

(6) L. C. Nitsche, PI, "Economic analysis of a desalination process using zeolite membranes." Subcontract from New Mexico Institute of Mining and Technology. Period: 1/01/ 2005 – 05/31/2006. Budget: $30,000.

(5) L. C. Nitsche, USIA Fulbright Senior Scholar Program, 1999-2000, Award #9498: Austria, Research. Budget: ATS 125,000 (approximately $9,600).

(4) L. C. Nitsche and J. M. Nitsche, PIs on NSF conference grant administered through UIC. Award date: 07/01/1995. Grant number CTS-9525791. Budget: $8,300. Supporting package of corporate sponsorships and donations: approximately $3,500.

(3) L. C. Nitsche, PI, 1994 NSF Young Investigator (NYI) Award; Grant number: CTS-9457039. Period: 09/01/ 1994 – 08/31/1999. Budget: $135,895.

(2) L. C. Nitsche, PI, ACS-Petroleum Research Fund Type G grant: "Nonlinear Hydrodynamic Drift Effects in Microporous Transport of Colloids and Macromolecules." Grant number: ACS-PRF# 28439-G9. Period: 9/01/1994 – 8/31/1996. Budget: $20,000.

(1) L. C. Nitsche, PI, NSF Research Initiation Award: "Antisedimentation Dialysis: Fundamentals and Applications in Membrane Characterization, Fractionation of Macrosolutes, and Simulation of Microgravity." Grant number: CTS-9210277. Period: 06/01/1992 – 11/30/1995. Budget: $91,680.

Symposia / technical sessions organized / chaired: 13.

Representative presentations at technical conferences (51 cumulative).

L. C. Nitsche (Speaker), R. G. Henriquez Rivera, P. Leon Plata and Y. Liu, "Shape Evolution of Miscible Drops with Arbitrary Viscosity Ratio: Lagrangian-Eulerian Swarms of Stokeslets and Subgrid Resolution" (Presentation 444b). AIChE 2017 Annual Meeting, Minneapolis, Minnesota October 29 – November 3, 2017.

L. C. Nitsche (Speaker), J. M. Nitsche and G. B. Kasting, "Microscopic Diffusion Model and Particle-Based Computer Simulations of Stratum Corneum Permeability" (Invited Talk, 1473), InterPore 2016 – 8th International Conference on Porous Media & Annual Meeting, Cincinnati, Ohio, May 9-12, 2016.

L. Pyrak-Nolte, E. Boomsma and L. C. Nitsche (Speaker), "Wall effects in the sedimentation of micro- and nano-particulate swarms within fractures: combined insights from experiments and computer simulations" (Talk 1050), InterPore 2016 – 8th International Conference on Porous Media & Annual Meeting, Cincinnati, Ohio, May 9-12, 2016.

J. M. Nitsche (Speaker), L. C. Nitsche and G. B. Kasting, "A New Microscopic Model of Permeability and Lateral Diffusion in the Stratum Corneum Barrier Layer of Skin" Paper 571h, AIChE 2014 Annual Meeting, Atlanta, GA, November 16-21, 2014.

L. C. Nitsche (Speaker), J. M. Nitsche and G. B. Kasting, "Modeling of Diffusion in Stratified Epithelia Using Smoothed Particle Hydrodynamics" (Presentation 549i). AIChE 2013 Annual Meeting, San Francisco, CA, November 3-8, 2013.

L. C. Nitsche (Speaker) and B. Bernal, "Asymptotic Theory and Numerical Analysis for Unraveling the Stokes Flow Singularity At the Junction Between Solid and Porous Walls With Arbitrary Wedge Angle" (Presentation 368a) AIChE 2013 Annual Meeting, San Francisco, CA, November 3-8, 2013.

Graduate research students

Prashanth Parthsarathi	PhD	Summer 2008
Javier Rios	MS	Summer 2006
Olga Jedry	MS	Fall 2005
Tejas Shah	MS	Spring 2005 (co-advised with S. Murad)
Weidong Zhang	PhD	Spring 2004
Shan Zhuge	MS	Fall 1995