

# TONY SAAD

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<b>CONTACT</b>	Tony Saad <a href="#">Institute for Clean &amp; Secure Energy</a> <a href="#">The University of Utah</a> 155 E 1452 S, INSCC 366 Salt Lake City, UT 84112, USA	<i>Cell:</i> (801) 810-7223 <i>Office:</i> (801) 585-0344 <i>E-mail:</i> <a href="mailto:saadtony@gmail.com">saadtony@gmail.com</a> <i>web:</i> <a href="http://www.tsaad.net">www.tsaad.net</a>
<b>OBJECTIVE</b>	Placement in an academic faculty position.	
<b>RESIDENCY</b>	Permanent resident.	
<b>RESEARCH INTERESTS</b>	Computational & theoretical fluid dynamics, Low-Mach-number flows, Pressure projection methods, High-performance hybrid parallel computing, Analytical & asymptotic methods, Solid/Hybrid/Liquid propulsion, Simulation science, Population balances	
<b>CAREER</b>	<b>Senior Computational Scientist</b>	<b>Institute for Clean &amp; Secure Energy, Univ. of Utah</b> <b>Aug 2014 – present</b>
	<b>Research Associate</b>	<b>Institute for Clean &amp; Secure Energy, Univ. of Utah</b> <b>May 2012 – Aug 2014</b>
	<b>Postdoctoral Fellow</b>	<b>Institute for Clean &amp; Secure Energy, Univ. of Utah</b> <b>May 2010 – May 2012</b>
	<b>PH.D.</b>	<b>University of Tennessee Space Institute, Mechanical Engineering</b> <b>May 2010</b>
	<b>M.E.</b>	<b>American University of Bierut</b> <b>Oct 2005</b>
	<b>B.E.</b>	<b>Notre Dame University</b> <b>Aug 2003</b>
<b>RESEARCH EXPERIENCE</b>	<ul style="list-style-type: none"><li>• Experience in large scale computational fluid dynamics (CFD) software development.</li><li>• Experience in object oriented and template metaprogramming using C++.</li><li>• Experience in management of large-scale software: svn, git, regression testing, and using buildbots.</li><li>• Experience in programming the finite volume method: structured (staggered) and unstructured grids.</li><li>• Experience in parallel computing using MPI.</li><li>• Experience in pressure-projection methods: Pressure poisson equation, boundary conditions.</li><li>• Experience in analytical modeling of fluid dynamics problems using exact and asymptotic methods: perturbation, decomposition, and homotopy techniques.</li><li>• Experience in embedded boundary methods using sharp-interface cut cells.</li><li>• Experience in LES and its verification (Smagorinsky, WALE, Vreman).</li><li>• Experience in order-of-accuracy verification and code validation.</li><li>• Extensive experience (8+ years) in using Fluent to model various flow regimes and physics (multiphase, combustion, turbulence, free surface, and supersonic).</li><li>• Experience in writing user defined functions for Fluent.</li></ul>	
<b>ACADEMIC EXPERIENCE</b>	<b>University of Tennessee Space Institute</b> <ul style="list-style-type: none"><li>• Substitute lecturer and grader for Perturbations methods 1.</li><li>• Substitute lecturer for Advanced perturbation methods.</li></ul>	

- Substitute lecturer for Hybrid propulsion.
- Contributed to a book chapter in AIAA progress series. Fundamentals of Hybrid Rocket Combustion and Propulsion - Chapter 4 "Analytical Models for Hybrid Rockets".

#### **American University of Beirut**

- Teaching assistant for Solidification.
- Teaching assistant for Computational Fluid Dynamics.
- Teaching assistant for Numerical Methods.

#### **PUBLICATIONS** BOOK CHAPTERS [1]

- 2012 Majdalani, J., and Saad, T., (2012). **Internal Flows Driven by Wall-Normal Injection**, *Advanced Fluid Dynamics*, Prof. Hyoung Woo Oh (Ed.), ISBN: 978-953-51-0270-0, InTech, Available from: <http://www.intechopen.com/books/advanced-fluid-dynamics/internal-flows-driven-by-wall-normal-injection>.

#### REFEREED ARTICLES [12]

- 2015 **T. Saad** and J. C. Sutherland. Wasatch: an architecture-proof multiphysics development environment using a domain specific language and graph theory. *Under Review, Journal of Computational Science*, 2015
- 2015 **T. Saad**, D. Cline, J. C. Sutherland, and R. Stoll. Scalable tools for generating synthetic isotropic turbulence with arbitrary spectra. *Under Review, Journal of the Acoustical Society of America*, 2015
- 2015 A. W. Abboud, B. B. Schroeder, **T. Saad**, S. T. Smith, D. D. Harris, and D. O. Lignell. A numerical comparison of precipitating turbulent flows between large-eddy simulation and one-dimensional turbulence. *AIChE Journal*, 61(10):3185–3197, 2015. (doi:10.1002/aic.14870)
- 2015 **T. Saad**, A. W. Abboud, S. T. Smith, and T. A. Ring. A class of exact solutions for population balances with arbitrary internal coordinates. *AIChE Journal*, 61(5):1691–1698, 2015. (doi:10.1002/aic.14739)
- 2013 D. S. Crawford, **T. Saad**, and T. A. Ring. Verification and validation of the maximum entropy method for reconstructing neutron flux, with mcnp5, attila-7.1. 0 and the godiva experiment. *Annals of Nuclear Energy*, 53:188–191, 2013
- 2012 **T. Saad** and J. Majdalani. Some thoughts on the pressure integration requirements of the navier–stokes equations. *Fluid Dynamics Research*, 44(6):065508, 2012
- 2012 B. A. Maicke, **T. Saad**, and J. Majdalani. On the compressible hart-mcclure and sellars mean flow motions. *Physics of Fluids*, 24(9):096101, 2012
- 2009 **T. Saad** and J. Majdalani. On the Lagrangian Optimization of Wall-Injected Flows: From the Hart–McClure Potential to the Taylor–Culick Rotational Motion. *Proceedings of the Royal Society A: Mathematical, Physical and Engineering Science*, 466(2114):331–362, 2009
- 2009 **T. Saad** and J. Majdalani. Rotational flowfields in porous channels with arbitrary headwall injection. *Journal of Propulsion and Power*, 25(4):921–929, 2009
- 2008 M. Darwish, **T. Saad**, and Z. Hamdan. Parallelization of an additive multigrid solver. *Numerical Heat Transfer, Part B: Fundamentals*, 54(2):157–184, 2008
- 2007 O. C. Sams, J. Majdalani, and **T. Saad**. Mean flow approximations for solid rocket motors with tapered walls. *Journal of Propulsion and Power*, 23(2):445–456, 2007
- 2007 J. Majdalani and **T. Saad**. The Taylor–Culick profile with arbitrary headwall injection. *Physics of Fluids*, 19(9):093601–10, 2007
- 2006 **T. Saad**, O. C. Sams, IV, and J. Majdalani. Rotational flow in tapered slab rocket motors. *Physics of Fluids*, 18(10):103601, 2006

#### REFEREED CONFERENCE PAPERS [28]

- 2015 **T. Saad** and J. C. Sutherland. Wasatch: Addressing multiphysics and hardware complexity in a high-performance computing environment. In *Workshop on Software Development Environments for High-Performance Computing*, San Francisco, CA, USA, October 2015
- 2015 J. C. Sutherland and **T. Saad**. Nebo: an embedded domain-specific language for platform-agnostic pde solvers. In *PACT15 Tutorial on Software Stacks for Next-Gen Production Codes*, San Francisco, CA, USA, October 2015
- 2015 **T. Saad**, A. Bagusetty, and J. C. Sutherland. Wasatch: A CPU/GPU-Ready Multiphysics Code using a Domain Specific Language. In *SIAM Conference on Computational Science and Engineering*, Salt Lake City, UT, March 2015
- 2015 **T. Saad**, C. Earl, A. Bagusetty, M. Might, and J. C. Sutherland. Uintah/Wasatch: Addressing Multiphysics Complexity in a High-Performance Computing Environment. In *SIAM Conference on Computational Science and Engineering*, Salt Lake City, UT, March 2015
- 2014 J. C. Sutherland, M. Might, C. Earl, and **T. Saad**. Design Paradigms to Accommodate Architectural Uncertainty in Multiphysics Applications. In *SIAM Parallel Processing Conference*, Portland, OR, Feb. 2014
- 2013 A. W. Abboud, **T. Saad**, J. Thornock, and S. T. Smith. Large Eddy Simulation of a Precipitate Flow With QMOM. In *AICHE Annual Meeting*, San Francisco, CA, USA, November 2013
- 2013 A. Biglari, **T. Saad**, and J. C. Sutherland. An Efficient and Explicit Pressure Projection Method for Reacting Flow Simulations. In *8th National US Combustion Meeting*, pages 1–14, Salt Lake City, UT, May 2013
- 2013 J. Schmidt, M. Berzins, J. Thornock, **T. Saad**, and J. Sutherland. Large Scale Parallel Solution of Incompressible Flow Problems using Uintah and Hypre. In *International Symposium on Cluster, Cloud and Grid Computing*, Delft, Netherlands, May 2013
- 2013 A. Biglari, **T. Saad**, and J. C. Sutherland. A Time-Accurate Pressure Projection Method for Reacting Flows. In *SIAM Numerical Combustion Conference*, San Antonio, TX, Apr. 2013
- 2012 C. W. Earl, D. Robison, **T. Saad**, J. C. Sutherland, and M. Might. Automated Algorithm Construction for Large Scale Computational Physics and Reacting Flow Simulations : Software Infrastructure. In *Parallel Computational Fluid Dynamics*, Atlanta, GA, May 2012
- 2012 A. W. Abboud, S. T. Smith, **T. Saad**, and J. Thornock. Modeling Precipitation Reactions in Turbulent Flow with QMOM Incorporated Into LES. In *AICHE Annual Meeting*, Pittsburgh, PA, USA, October 2012
- 2011 A. W. Abboud, S. T. Smith, **T. Saad**, and T. A. Ring. A study of population balance modeling in a large-eddy simulation with carbonate precipitation. In *AICHE Annual Meeting*, Minneapolis, Minnesota, USA, October 2011
- 2011 **T. Saad**, S. T. Smith, A. W. Abboud, and T. A. Ring. On a class of analytical solutions for the population balance equation. In *AICHE Annual Meeting*, Minneapolis, Minnesota, USA, October 2011
- 2011 J. C. Sutherland and **T. Saad**. A Novel Computational Framework for Reactive Flow and Multiphysics Simulations. In *AICHE Annual Meeting*, Minneapolis, MN, Oct. 2011
- 2011 B. Maicke, **T. Saad**, and J. Majdalani. Coordinate independent forms of the compressible potential flow equations. In *47th AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit*, San Diego, California, USA, July 2011
- 2011 **T. Saad** and J. Majdalani. Viscous flows revisited in simulated rockets with radially regressing walls. In *47th AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit*, San Diego, California, USA, July 2011
- 2011 **T. Saad** and J. Majdalani. Some thoughts on Kelvin’s minimum energy theorem. In *International Conference on Advanced Research and Applications in Mechanical Engineering*, 2011

- 2011 J. C. Sutherland and **T. Saad**. The Discrete Operator Approach to the Numerical Solution of Partial Differential Equations. In *20th AIAA Computational Fluid Dynamics Conference*, pages AIAA-2011-3377, Honolulu, Hawaii, USA, June 2011
- 2011 D. Robinson, N. Punati, **T. Saad**, and J. C. Sutherland. A novel computational approach for multi-physics and reactive flow simulations. In *Proceedings of the Combustion Institute*, 2011
- 2010 B. Maicke, **T. Saad**, and J. Majdalani. On the compressible irrotational Taylor flow in porous channels. In *40th AIAA Fluid Dynamics Conference and Exhibit*, Chicago, Illinois, USA, June 2010
- 2010 **T. Saad** and J. Majdalani. Pressure integration rules and restrictions for the Navier-Stokes equations. In *40th AIAA Fluid Dynamics Conference and Exhibit*, Chicago, Illinois, USA, June 2010
- 2010 **T. Saad** and J. Majdalani. Extension of Kelvin's minimum energy theorem to flows with open regions. In *40th AIAA Fluid Dynamics Conference and Exhibit*, Chicago, Illinois, USA, June 2010
- 2009 **T. Saad** and J. Majdalani. Energy based solutions of the bidirectional vortex with multiple mantles. In *45th AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit*, (AIAA Paper 2009-5305), Denver, Colorado, Aug. 2009
- 2009 **T. Saad** and M. Darwish. A high scalability parallel algebraic multigrid solver. In *Computational Fluid Dynamics 2006*, pages 231-236. Springer, 2009
- 2008 **T. Saad** and J. Majdalani. Energy based solutions of the bidirectional vortex. In *44th AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit*, (AIAA Paper 2008-4832), Hartford, Connecticut, July 2008
- 2008 **T. Saad** and J. Majdalani. Energy based mean flow solutions for slab hybrid rocket chambers. In *44th AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit*, (AIAA Paper 2008-5021), Hartford, Connecticut, July 2008
- 2007 **T. Saad** and J. Majdalani. The Taylor profile in porous channels with arbitrary headwall injection. In *37th AIAA Fluid Dynamics Conference and Exhibit*, volume 2007-4120 of (*AIAA Paper 2007-4120*), Miami, Florida, 2007
- 2007 J. Majdalani and **T. Saad**. Energy steepened states of the Taylor-Culick profile. In *43rd AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit*, (AIAA Paper 2007-5797), Cincinnati, Ohio, July 2007
- 2006 M. Darwish and **T. Saad**. A high scalability parallel algebraic multigrid solver. In *European Conference on Computational Fluid Dynamics*, pages 231-236, Egmond aan Zee, The Netherlands, September 2006
- 2006 **T. Saad** and M. Darwish. A high scalability parallel algebraic multigrid solver. In *4th ICCFD Conference*, Ghent, Belgium, July 2006
- 2005 **T. Saad**. Implementation and performance analysis of a parallel algebraic multigrid solver. In *4th FEA Student Conference at the American University of Beirut*, Riad El Solh, Lebanon, May 2005

**COMPUTER SKILLS** C, C++, templated C++ metaprogramming, VISIT, Message Passing Interface (MPI), HTML/CSS/Web Design, LaTeX, Fluent, Mathematica, Matlab.

**SERVICE**

- Co-PI on SBIR submitted with Reaction Engineering International, SLC, UT.
- Reviewer for: Combustion Theory and Modelling, Flow Turbulence and Combustion, International Journal of Energetic Materials and Chemical Propulsion.
- Helped review proposals.
- Judged AIAA student conference papers.
- Chaired graduate technical sessions in AIAA student conference.
- CFD-Online Wiki: Administrator and author (<http://www.cfd-online.com/Wiki>).
- PMAN: Founder and author - online science journal (<http://pman.tsaad.net>).
- Show Me the Math: Founder and author - online repository of numerics-related mathematical proofs and derivations (<http://www.tsaad.net/showmethemath/>).

## AWARDS

- NSF IREE research internship – Peking University, 2008.
- “Outstanding Graduate Research Assistant” award – University of Tennessee Space Institute, 2007.
- Crawford Lloyd Fellowship – University of Tennessee Space Institute, 2005 & 2007.
- Graduate Research Assistantship – University of Tennessee Space Institute, 2005 - 2010.
- Graduate Research Assistantship – American University of Beirut, 2003-2005.
- Dean’s List – American University of Beirut, all semesters.
- “Abd el Aal Litani River Award”, 2003.
- Exemption from tuition fees – Notre Dame University, spring 2003.
- Scholarship: 25-50% Scholarship – Notre Dame University, all semesters.
- Dean’s List – Notre Dame University, all semesters.

**LANGUAGES** Fluent in English, French, and Arabic.

## REFERENCES

[Prof. James C. Sutherland](#)  
Associate Professor  
Chemical Engineering  
University of Utah  
Salt Lake City, UT, 84112  
Office: (801) 585-1246  
[james.sutherland@utah.edu](mailto:james.sutherland@utah.edu)

[Dr. Brian Maicke](#)  
Assistant Professor  
Mechanical Engineering  
Penn State University, Harrisburg  
Middletown, PA, 17057  
Office: (717) 948-6662  
[bam49@psu.edu](mailto:bam49@psu.edu)

[Prof. Terry A. Ring](#)  
Professor  
Chemical Engineering  
University of Utah  
Salt Lake City, UT, 84112  
Office: (801) 585-5705  
[ring@eng.utah.edu](mailto:ring@eng.utah.edu)

[Prof. Joseph Majdalani](#)  
Professor and Department Chair  
Aerospace Engineering  
Auburn University  
Auburn, AL, 36849  
Office: (334) 844-6800  
[joe.majdalani@auburn.edu](mailto:joe.majdalani@auburn.edu)

[Dr. Sean T. Smith](#)  
Assistant Research Professor  
Chemical Engineering  
University of Utah  
Salt Lake City, UT, 84112  
Office: (801) 585-1002  
[sean.t.smith@utah.edu](mailto:sean.t.smith@utah.edu)

[Prof. Michel el Hayek](#)  
Professor and Dean  
Mechanical Engineering  
Notre Dame University  
Zouk Mosbeh, Lebanon  
Office: (961) 9-218-950 – Ext: 2032  
[mhayek@ndu.edu.lb](mailto:mhayek@ndu.edu.lb)

Hello. My name is Tony Saad. I am an assistant professor of Chemical Engineering at the University of Utah. I love math, fluid mechanics, scientific computing, and programming. I am also a recent father to a young boy. I hope you will find my musings on this site useful. Cheers and thanks for stopping by! Archives.