

## Jonathan E. Moussa

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CITIZENSHIP	USA	
RESEARCH INTERESTS	Computational physics, computational materials science, scientific computing, condensed matter physics, electronic structure theory, quantum chemistry, quantum information theory, quantum error correction, quantum simulation, numerical analysis, numerical linear algebra, classical algorithms, quantum algorithms.	
EDUCATION	<p><a href="#">The University of California at Berkeley</a>, Berkeley, CA, USA</p> <p>Ph.D., <a href="#">Physics</a>, May 2008</p> <ul style="list-style-type: none"><li>• Thesis Topic: <i>Theoretical study of electron-phonon superconductivity</i></li><li>• Adviser: <a href="#">Professor Marvin L. Cohen</a></li></ul> <p><a href="#">Worcester Polytechnic Institute</a>, Worcester, MA, USA</p> <p>M.S., <a href="#">Physics</a>, May 2004</p> <ul style="list-style-type: none"><li>• Thesis Topic: <i>The Schrodinger-Poisson selfconsistency in layered quantum semiconductor structures</i></li><li>• Adviser: <a href="#">Professor L. Ramdas Ram-Mohan</a></li></ul> <p>B.S., <a href="#">Mathematics</a> and <a href="#">Physics</a>, May 2001</p>	
JOB EXPERIENCE	<p><b>Software Scientist</b> July 2018 to present <a href="#">Molecular Sciences Software Institute</a>, Blacksburg, VA USA</p> <p><b>Staff Scientist</b> November 2014 to July 2018 Nonconventional Computing Technologies Department, Center for Computing Research, <a href="#">Sandia National Laboratories</a></p> <p><b>Postdoctoral Researcher</b> August 2011 to November 2014 Advanced Device Technologies Department, Center for Computing Research, <a href="#">Sandia National Laboratories</a></p> <p><b>Postdoctoral Researcher</b> July 2008 to July 2011 <a href="#">Center for Computational Materials</a>, <a href="#">Institute for Computational Engineering and Sciences</a>, <a href="#">The University of Texas at Austin</a></p> <p><b>Graduate Student</b> August 2002 to June 2008 <a href="#">Physics Department</a>, <a href="#">The University of California at Berkeley</a></p> <p><b>Summer Intern</b> Summers of 2000 and 2002 <a href="#">Air Force Research Laboratory's Sensors Directorate</a>, <a href="#">Wright Patterson Air Force Base</a></p> <p><b>Programming Consultant</b> August 1998 to June 2002 <a href="#">Quantum Semiconductor Algorithms</a>, Northborough, MA USA</p>	
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19. **Moussa, J. E.** Transversal Clifford gates on folded surface codes. *Physical Review A* 94:042316 (2016). doi:[10.1103/PhysRevA.94.042316](https://doi.org/10.1103/PhysRevA.94.042316).
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13. **Moussa, J. E.**, S. M. Foiles, and P. A. Schultz. Simulation and modeling of the electronic structure of GaAs damage clusters. *Journal of Applied Physics*, 113:093706 (2013). doi:[10.1063/1.4794164](https://doi.org/10.1063/1.4794164).
12. **Moussa, J. E.** Comment on “Fast and Accurate Modeling of Molecular Atomization Energies with Machine Learning”. *Physical Review Letters*, 109:059801 (2012). doi:[10.1103/PhysRevLett.109.059801](https://doi.org/10.1103/PhysRevLett.109.059801).
11. **Moussa, J. E.**, P. A. Schultz, and J. R. Chelikowsky. Analysis of the Heyd-Scuseria-Ernzerhof density functional parameter space. *The Journal of Chemical Physics*, 136:204117 (2012). doi:[10.1063/1.4722993](https://doi.org/10.1063/1.4722993).
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  5. **Moussa, J. E.** and M. L. Cohen. Constraints on  $T_c$  for superconductivity in heavily boron-doped diamond. *Physical Review B*, 77:064518 (2008). doi:[10.1103/PhysRevB.77.064518](https://doi.org/10.1103/PhysRevB.77.064518).
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  3. Ram-Mohan, L. R., K. H. Yoo, and **J. Moussa**. The Schrödinger-Poisson self-consistency in layered quantum semiconductor structures. *Journal of Applied Physics*, 95:3081 (2004). doi:[10.1063/1.1649458](https://doi.org/10.1063/1.1649458).
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  1. **Moussa, J.**, L. R. Ram-Mohan, J. Sullivan, T. Zhou, D. R. Hines, and S. A. Solin. Finite-element modeling of extraordinary magnetoresistance in thin film semiconductors with metallic inclusions. *Physical Review B*, 64:184410 (2001). doi:[10.1103/PhysRevB.64.184410](https://doi.org/10.1103/PhysRevB.64.184410).
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12. **Moussa, J. E.**. Minimax separation of the Cauchy kernel. [arXiv:1909.06911](https://arxiv.org/abs/1909.06911) (2019).
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  10. **Moussa, J. E.**. Measurement-Based Quantum Metropolis Algorithm. [arXiv:1903.01451](https://arxiv.org/abs/1903.01451) (2019).
  9. Shulenburger, L., A. D. Baczewski, S. M. Foiles, A. E. Wills, N. A. Modine, **J. E. Moussa**, P. A. Schultz, V. Tikare, and A. F. Wright. Next-Generation Electronic Structure Codes. Sandia Technical Report SAND2016-9782 (2016).
  8. **Moussa, J. E.**. Linear embedding of free energy minimization. [arXiv:1603.05180](https://arxiv.org/abs/1603.05180) (2016).
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  6. **Moussa, J. E.** and A. D. Baczewski. Comment on “Self-Averaging Stochastic Kohn-Sham Density-Functional Theory”. [arXiv:1311.6576](https://arxiv.org/abs/1311.6576) (2013).
  5. **Moussa, J. E.**. Comment on “Adiabatic Quantum Algorithm for Search Engine Ranking”. [arXiv:1310.6676](https://arxiv.org/abs/1310.6676) (2013).

4. **Moussa, J. E.** and P. A. Schultz. Accurate numerical integration of an electron exchange hole with a screened Coulomb interaction. [arXiv:1210.8233](#) (2012).
3. **Moussa, J. E.**. Generalized unitary Bogoliubov transformation that breaks fermion number parity. [arXiv:1208.1086](#) (2012).
2. **Moussa, J. E.**. Approximate diagonalization method for many-fermion Hamiltonians. [arXiv:1003.2596](#) (2010).
1. **Moussa, J. E.**. Perfect algebraic coarsening. [arXiv:math/0505157](#) (2005).

AWARDED GRANTS 1. **Moussa, J. E.** and M. Sarovar. Realizing the Power of Near-Term Quantum Technologies. 0.6 FTE for 2 years. *Sandia National Labs' Laboratory Directed Research and Development Program, Defense Systems and Assessments Mission Area* (2015).

INVITED TALKS 5. **Moussa, J. E.**. Local reduction of Hermitian eigenproblems. *2017 Meeting of the International Linear Algebra Society* (July 24, 2017).

4. **Moussa, J. E.**. Designing shallow donors in diamond. *March Meeting of the American Physical Society* (March 4, 2015).

3. **Moussa, J. E.**. Interdisciplinary Perspectives on Electronic Structure Theory. *Scuseria research group, Rice University* (January 8, 2014).

2. **Moussa, J. E.**. Eigensolvers in Condensed Matter Physics, Condensed Matter Physics in Eigensolvers. *Computer Science Research Institute, Sandia National Laboratories* (March 29, 2011).

1. Chelikowsky, J. R. and **J. E. Moussa**. Algorithms for the Quantum Modeling of the Properties of Nanocrystals, Nanofilms, and Nanowires. *SIAM Conference on Computational Science and Engineering* (March 4, 2009).

CONTRIBUTED TALKS 16. **Moussa, J. E.**. Testing, analysis, and refinement of the quantum Metropolis algorithm. *March Meeting of the American Physical Society* (March 5, 2019).

15. **Moussa, J. E.**. Localized and Randomized Algorithms for Electronic Structure. *March Meeting of the American Physical Society* (March 7, 2018).

14. **Moussa, J. E.**. Transversal Clifford gates on folded surface codes. *March Meeting of the American Physical Society* (March 16, 2017).

13. **Moussa, J. E.**. Convex Lower Bounds for Free Energy Minimization. *March Meeting of the American Physical Society* (March 16, 2016).

12. **Moussa, J. E.**. Quantum Simulation: Classical Algorithms Versus Analog Simulators. *March Meeting of the American Physical Society* (March 3, 2015).

11. **Moussa, J. E.**. Maximum entropy quantum simulation. *XXVI IUPAP Conference on Computational Physics* (August 13, 2014).

10. **Moussa, J. E.**. Acceleration of screened-exchange density-functional calculations with approximate differential overlap. *March Meeting of the American Physical Society* (March 4, 2014).

9. **Moussa, J. E.**. Cubic-scaling algorithm and self-consistent mean field for the random-phase approximation with second-order screened exchange. *March Meeting of the American Physical Society* (March 18, 2013).

	<ol style="list-style-type: none"> <li>8. <b>Moussa, J. E.</b>, P. A. Schultz, and J. R. Chelikowsky. Retrofit of the HSE density functional. <i>March Meeting of the American Physical Society</i> (February 27, 2012).</li> <li>7. <b>Moussa, J. E.</b> and J. R. Chelikowsky. Size-dependence of electronic and optical properties of armchair graphene nanoislands. <i>March Meeting of the American Physical Society</i> (March 23, 2011).</li> <li>6. <b>Moussa, J. E.</b> and J. R. Chelikowsky. The Truncated Eigenfermion Decomposition applied to the Hubbard model. <i>March Meeting of the American Physical Society</i> (March 15, 2010).</li> <li>5. <b>Moussa, J. E.</b> and J. R. Chelikowsky. A Brief Introduction to the Truncated Eigenfermion Decomposition. <i>March Meeting of the American Physical Society</i> (March 17, 2009).</li> <li>4. <b>Moussa, J. E.</b> and M. L. Cohen. Constraints on <math>T_c</math> for superconductivity in heavily boron-doped diamond. <i>March Meeting of the American Physical Society</i> (March 11, 2008).</li> <li>3. <b>Moussa, J. E.</b> and M. L. Cohen. Possibility of superconductivity in high pressure phases of <math>BC_3</math>. <i>March Meeting of the American Physical Society</i> (March 6, 2007).</li> <li>2. <b>Moussa, J. E.</b> and M. L. Cohen. Stability Constraints and Local Criteria for the Bounds on <math>T_c</math> of Conventional Superconductors. <i>March Meeting of the American Physical Society</i> (March 16, 2006).</li> <li>1. <b>Moussa, J. E.</b> and M. L. Cohen. Compact representation of the Green function of an infinite periodic system. <i>March Meeting of the American Physical Society</i> (March 23, 2005).</li> </ol>
PATENTS	<ol style="list-style-type: none"> <li>1. Hine, D. R., S. A. Solin, T. Zhou, <b>J. E. Moussa</b>, L. R. Ram-Mohan, J. M. Sullivan Jr. Method and system for finite element modeling and simulation of enhanced magnetoresistance in thin film semiconductors with metallic inclusions. U.S. Patent #6,937,967 (2005).</li> </ol>
REFeree FOR JOURNALS	<ul style="list-style-type: none"> <li>• <i>Physical Review B</i></li> <li>• <i>Physical Review Letters</i></li> <li>• <i>The Journal of Chemical Physics</i></li> <li>• <i>Mathematical Reviews</i></li> </ul>
AWARDS	<ul style="list-style-type: none"> <li>• <i>Salisbury Prize</i>, Worcester Polytechnic Institute (2001).</li> <li>• <i>Employee Recognition Award</i>, Enceladus: Quantum Computer Benchmarking Team, Sandia National Laboratories (2016).</li> </ul>
TEACHING EXPERIENCE	<p><b>The University of California at Berkeley</b>, Berkeley, CA USA</p> <p><i>Graduate Student Instructor</i> <span style="float: right;"><b>September 2002 to December 2002</b></span></p>
PROGRAMMING SKILLS	C, C++, Fortran, Python, T <sub>E</sub> X