

# ROBERT J. VANDERBEI

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Operations Research and  
Financial Engineering  
Princeton University



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## EDUCATION

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### *Cornell University*

**Ph.D. in Applied Mathematics** 1981  
*Dissertation Title: "Toward a Stochastic Calculus for Several Markov Processes"*  
*Advisor: E.B. Dynkin Thesis Committee: F. Spitzer, H.M. Taylor*  
**M.S. in Applied Mathematics** 1979

### *Rensselaer Polytechnic Institute*

**M.S. in Operations Research and Statistics** 1978  
**B.S. in Chemistry** 1976

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## EMPLOYMENT/POSITIONS

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### *Princeton University*

**Department Chair**, Operations Research and Financial Engineering 2005 – 2012  
**Professor**, Operations Research and Financial Engineering (formerly CEOR) 1996 –  
**Affiliated Member**  
Mechanical and Aerospace Engineering 2011 –  
Astrophysics 2006 –  
Mathematics 2003 –  
Computer Science 2000 –  
Applied and Computational Mathematics 1994 –  
**Associate Professor**, Civil Engineering and Operations Research 1990 – 1996

### *AT&T Bell Laboratories*

**Member of Technical Staff**, Mathematics Research Center 1984 – 1991

### *University of Illinois at Urbana-Champaign*

**Visiting Lecturer**, Mathematics 1982 – 1984

### *Courant Institute of Mathematical Sciences at NYU*

**NSF Postdoctoral Research Fellow**, Mathematics 1981 – 1982

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## HONORS

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**Khachiyan Prize** INFORMS Optimization Society 2017  
**Fellow** American Mathematical Society (AMS) 2014–  
**Fellow** Society for Industrial and Applied Mathematics (SIAM) 2012–  
**Fellow** Institute for Ops. Res. and Mgmt. Sciences (INFORMS) 2006–

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## SELECTED PLENARY ADDRESSES

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*The Parametric Self-Dual Simplex Method – A Modern Perspective*, **Distinguished Lecture, Omega Rho**, Seattle WA, October 2019.

*Sparsity Matters*, **Khachiyan Prize Talk, INFORMS**, Houston TX, October 2017.

*Numerical Optimization Applied to Space-Related Problems*, **Distinguished Alumni Colloquium**, Cornell University, November 2016.

*Linear Optimization*, **Machine-Learning Summer School**, LaPalma Canary Islands, April 2012.

*Extreme Optics and the Search for Earth-Like Planets*, **ISMP**, Rio de Janeiro, August 2006.

*Nonlinear Programming and Engineering Applications* (tutorial), **INFORMS**, Denver, Oct. 2004.

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## GRANTS

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**Office of Naval Research** (1997–2008, 2013–2019) *Fast Fourier Optimization with Application to Antenna Array Control and High-Contrast Imaging*, principal investigator

**NASA** (2001–2006, 2004–2005, 2010–2012) *Concept Study of Pupil Mapping for High-Contrast Imaging*, principal investigator

**National Science Foundation.** (1995–2004) *Interior Point Methods for Large Scale Nonlinear Programming*, principal investigator

Co-investigator on several other grants

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## PROFESSIONAL ACTIVITIES INCLUDING EDITORIAL POSITIONS

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Associate Editor, <i>Optimization in Engineering</i>	2014–2018
Associate Editor, <i>Mathematical Programming</i>	2003–2005
Associate Editor, <i>Optimization in Engineering</i>	2001–2005
Associate Editor, <i>INFORMS Journal on Computing</i>	1991–2001
Beale-Orchard Hayes Award Committee, Member/Chair	1993–1997
Editorial Board, <i>Optimization Methods and Software</i>	2014–
Editorial Board, <i>Foundations and Trends in Optimization</i>	2012–
Editorial Advisory Board, <i>Mathematical Programming Computation</i>	2008–
INFORMS Subdivisions Council, Member	2010–2012
INFORMS Sections and Societies Committee, Member	2010–2012
INFORMS Computing Society, Chair-Elect/Chair	2008–2011
INFORMS Expository Writing Award Committee, Member/Chair	2001–2003
INFORMS Khachiyan Prize Award Committee, Chair	2019
INFORMS Optimization Section, Chair	1999–2001
INFORMS Optimization Section Prize Committee, Chair	1999–2000
SIAG-OPT Optimization Prize Committee, Chair	2005, 2008

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 BOOKS
 

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1. E.Çınlar and R.J. Vanderbei. *Real and Convex Analysis*. Springer, 2013.
2. J.R. Gott and R.J. Vanderbei. *Sizing Up The Universe: The Cosmos In Perspective*. National Geographic, 2010.
3. R.J. Vanderbei. *Linear Programming: Foundations and Extensions*. Springer (formerly Kluwer), (1st edition) 1997, (paperback) 1998, (2nd edition) 2001, (3rd edition) 2007, (4th edition) 2013, (5th edition) 2020.
4. N.D. Tyson, J.R. Gott, M.A. Strauss, and R.J. Vanderbei. *Welcome to the Universe in 3D*. Princeton University Press, 2021. To appear.

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 SELECTED JOURNAL PUBLICATIONS
 

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(OUT OF 220 TOTAL)

1. R.J. Vanderbei. Sparsity matters. *INFORMS OS Today*, 8(1):10–16, 2018.
2. R.J. Vanderbei. The falling slinky. *American Mathematical Monthly*, 124(1):24–36, 2017.
3. B. Rudloff, F. Ulus, and R.J. Vanderbei. A parametric simplex algorithm for linear vector optimization problems. *Mathematical Programming, Series A*, 163(1):213–242, 2017.
4. R.J. Vanderbei, Kevin Lin, Han Liu, and Lie Wang. Revisiting Compressed Sensing: Exploiting the Efficiency of Simplex and Sparsification Methods. *Math. Prog. C*, 8:253–269, 2016.
5. R.J. Vanderbei, G. Scharf, and D. Marlow. A Regression Approach to Fairer Grading. *SIAM Review*, 56(2):337–352, 2014.
6. R. J. Vanderbei. Fast Fourier optimization. *Math. Prog. Comp.*, 4(1):53–69, 2012.
7. R.J. Vanderbei. Local Warming. *SIAM Review*, 54(3):597–606, 2012.
8. R.J. Vanderbei and M.Ç. Pinar. Pricing American Perpetual Warrants by Linear Programming. *SIAM Review*, 51:767–782, 2009.
9. R.J. Vanderbei. Extreme Optics and the Search for Earth-Like Planets. *Mathematical Programming Series B*, 112(1):255–272, 2008.
10. R.J. Vanderbei, E. Cady, and N.J. Kasdin. Optimal occulter design for finding extrasolar planets. *Astrophysical Journal*, 665(1):794–798, 2007.
11. N.J. Kasdin, R.J. Vanderbei, and R. Belikov. Shaped pupil coronagraphy. *C.R. Physique*, 8:312–322, 2007.
12. R.J. Vanderbei and E. Kolemen. Linear Stability of Ring Systems. *Astronomical Journal*, 133(2):656–664, 2007.
13. H.Y. Benson, A. Sen, D.F. Shanno, and R.J. Vanderbei. Interior-point algorithms, penalty methods and equilibrium problems. *Comp. Opt. and Appl.*, 34:155–182, 2006.
14. R. Belikov, N.J. Kasdin, and R.J. Vanderbei. Diffraction-Based Sensitivity Analysis of Apodized Pupil Mapping Systems. *Astrophysical Journal*, 652:833, 2006.
15. R.J. Vanderbei. Diffraction Analysis of 2-D Pupil Mapping for High-Contrast Imaging. *Astrophysical Journal*, 636:528, 2006.
16. R.J. Vanderbei and W.A. Traub. Pupil Mapping in 2-D for High-Contrast Imaging. *Astrophysical Journal*, 626:1079–1090, 2005.
17. H.Y. Benson, D.F. Shanno, and R.J. Vanderbei. Interior-Point Methods for Nonconvex Nonlinear Programming: Jamming and Numerical Testing. *Mathematical Programming*, 99(1):35–48, 2004.
18. W.A. Traub and R.J. Vanderbei. Two-Mirror Apodization for High-Contrast Imaging. *Astrophysical Journal*, 599:695–701, 2003.

19. A. Ruszczyński and R.J. Vanderbei. Frontiers of Stochastically Nondominated Portfolios. *Econometrica*, 71(4):1287–1297, 2003.
20. R.J. Vanderbei and H.Y. Benson. Solving Problems with Semidefinite and Related Constraints Using Interior-Point Methods for Nonlinear Programming. *Mathematical Programming*, 95:279–302, 2003.
21. N.J. Kasdin, R.J. Vanderbei, D.N. Spergel, and M.G. Littman. Extrasolar Planet Finding via Optimal Apodized and Shaped Pupil Coronagraphs. *Astrophysical Journal*, 582:1147–1161, 2003.
22. D.F. Shanno and R.J. Vanderbei. Interior-Point Methods for Nonconvex Nonlinear Programming: Orderings and Higher-Order Methods. *Math. Prog.*, 87(2):303–316, 2000.
23. M. Muramatsu and R.J. Vanderbei. Primal-Dual Affine-Scaling Algorithms Fail for Semidefinite Programming. *Mathematics of Operations Research*, 24(1):149–175, 1999.
24. C. Helmberg, F. Rendl, R.J. Vanderbei, and H. Wolkowicz. An interior point method for semidefinite programming. *SIAM Journal on Optimization*, 6:342–361, 1996.
25. J.M. Mulvey, R.J. Vanderbei, and S.A. Zenios. Robust optimization of large scale systems. *Operations Research*, 43(2):264–281, 1995.
26. R.J. Vanderbei. A probabilistic formula for the concave hull of a function. *Ann. Prob.*, 23:2014–2021, 1995.
27. L.A. Shepp and R.J. Vanderbei. The complex zeros of random polynomials. *Transactions of the AMS*, 347(11):4365–4384, 1995.
28. R.J. Vanderbei and B. Yang. The simplest semidefinite programs are trivial. *Math. of OR*, 20:590–596, 1995.
29. R.J. Vanderbei. Affine-scaling trajectories associated with a semi-infinite linear program. *Math. of OR*, 20:163–174, 1995.
30. R.J. Vanderbei. Symmetric quasi-definite matrices. *SIAM Journal on Optimization*, 5(1):100–113, 1995.
31. R.J. Vanderbei. Interior-point methods: algorithms and formulations. *ORSA J. on Computing*, 6:32–34, 1994.
32. R.J. Vanderbei and T.J. Carpenter. Symmetric indefinite systems for interior-point methods. *Mathematical Programming*, 58:1–32, 1993.
33. R.J. Vanderbei. ALPO: Another linear program optimizer. *ORSA J. on Computing*, 5:134–146, 1993.
34. R.J. Vanderbei. Optimal switching among several Brownian motions. *SIAM Journal on Control and Optimization*, 30:1150–1162, 1992.
35. A. Mandelbaum, L.A. Shepp, and R.J. Vanderbei. Optimal switching between a pair of Brownian motions. *Ann. Prob.*, 18:1010–1033, 1990.
36. R.J. Vanderbei. Affine scaling for linear programs with free variables. *Mathematical Programming*, 43:31–44, 1989.
37. R.J. Vanderbei, M.S. Meketon, and B.F. Freedman. A modification of Karmarkar’s linear programming algorithm. *Algorithmica*, 1:395–407, 1986.
38. R.J. Vanderbei. Probabilistic solution of the Dirichlet problem for biharmonic functions in discrete space. *Ann. Prob.*, 12:311–324, 1984.
39. E.B. Dynkin and R.J. Vanderbei. Stochastic waves. *Transactions of the AMS*, 275:771–779, 1983.
40. R.J. Vanderbei. Toward a stochastic calculus for several Markov processes. *Adv. Appl. Math.*, 4:125–144, 1983.
41. G.F. Lawler and R.J. Vanderbei. Markov strategies for optimal control problems indexed by a partially ordered set. *Ann. Prob.*, 11:642–647, 1982.
42. A. Mandelbaum and R.J. Vanderbei. Optimal stopping and supermartingales over partially ordered sets. *Z. Warsch. verw. Gebiete*, 57:253–264, 1981.
43. R.J. Vanderbei. Optimal choice of a subset of a population. *Math. OR*, 5:481–486, 1980.