# Palle E. T. Jorgensen

Department of Mathematics | Office: (319) 335-0782 | Born: October 8, 1947
The University of Iowa | Fax: (319) 335-0627 | Copenhagen, Denmark
14 MacLean Hall | E-mail: jorgen@math.uiowa.edu | U.S. citizen 1979–
Iowa City, Iowa 52242 | URL: http://www.math.uiowa.edu/~jorgen/ | Married, three children

## Professional                                Ph.D. in mathematics: University of Aarhus, 1973

**1983–** Professor, Dept. of Mathematics, University of Iowa (NSF grants for the whole period)

**1982–84** Visiting Associate Professor, Dept. of Mathematics, University of Pennsylvania (on leave from Aarhus first year, and from Iowa second year; NSF grant, R.V. Kadison, PI)

**1979–83** Associate Professor, Mathematics Institute, University of Aarhus, Denmark, on leave from Stanford the first year (Danish Research Council grants)

**1977–79** Assistant Professor, Dept. of Mathematics, Stanford University (NSF grant, Jorgensen, PI)

**1973–77** Postdoctoral Research Fellow (support from the Danish Natural Science Research Council; partial support from the NSF, Grant MCS 77-02831, in 1977, Professor R.V. Kadison, PI)

**1973–77** Visiting Scholar, University of Pensylvania and University of Washington

Throughout his career, Jorgensen has been supported in part by the US National Science Foundation. He has authored or co-authored more than 150 research papers and several books.

## Special appointments

**1976** Invited member, NSF Summer Research Institute in Operator Theory, U. of New Hampshire

**1982–** Editor of *Acta Applicandae Mathematicae*; Member of Danish Academy of Natural Sciences

**1988–98** Editor of *Proceedings of the American Mathematical Society*

**1993–** Editor of *Proyecciones: Revista de Matemática* and *Panamerican Mathematical Journal*; Member of the NSF-AMS panel evaluating NSF-postdoc applications, other panels later

**2000–** Editor of *Journal of Mathematical Sciences* (new series, Delhi, India)

**2000–03** Elected member of the Editorial Boards Committee of the AMS

**2001–03** Member of the Committee on Publications of the AMS

**2001–** Editor of *Journal of Applied Mathematics and Computing* (formerly *KJCAM*)

**2003–** Member of International Editorial Committee, Foxwell & Davies Italia srl.

## Numbers on recent NSF grants

- NSF MCS-8300915, 1984; NSF DMS-8502363, DMS-8500879 (summer grant and conference grant), 1985–86; NSF DMS-8801329, 1987
- Equipment Grant DMS-8803685, 1988
- Award: Research grant from NATO, collaborative research, 1986–91
- AMS-NSF travel Kyoto, ICM, 1990
- NSF INT-9114401, U.S.–W. Europe Cooperative Research: Spectral Theory, 1992–96
- NSF INT-9722779, U.S.–W. Europe Cooperative Research: Spectral Theory, 1997–2000
- NSF INT-9724781, U.S.–Australia Cooperative Research: Invariant Elliptic and Subelliptic Operators, and Their Role in Geometry and Representation Theory, 1998–2001
- 3-year NSF grants: DMS-9102488, 1991–94; DMS-9401252, 1994–97; DMS-9700130, 1997–2000; DMS-9987777, 2000–03 (ext. 2003–04)
- NSF DMS-0139473, Collaborative Research (FRG): Focused Research on Wavelets, Frames, and Operator Theory, 2002–05

## Assignments and awards

- Semester Research Assignment, Spring 1989 and Fall 2000
- Fellowship from the Swedish Royal Academy of Science, April and May 1989
- Member of the Danish Research Academy International Faculty, appointed and paid by the Danish government (expenses only), 1991– , The New York Academy of Sciences, 1978–
- UI Faculty Scholar Award (half teaching for a three-year period), 1992–94
- Special Research Visitor at universities in Australia, Denmark, Germany, Hong Kong, Singapore, Italy, Japan, Korea, Norway, and Wales (UK), 1990–present

- Member of the IEEE, Signal Processing, 1999–
- Listed in *Who's Who in America*
- Frequent invited and featured speaker at international conferences in mathematics and physics, e.g.:
  - National Research Symposium on Geometric Analysis and Applications at The Australian National University in June of 2000;
  - International Conference on Wavelet Analysis and Its Applications held at Zhongshan University, Guangzhou, China, in November of 1999;
  - International Congress on Mathematical Physics, July 2000 in London;
  - GPOTS and IWOTA, 2002, plenary speaker.

**Synergistic activities**

In the past 5 years Jorgensen has created and taught courses for Mathematics and Engineering, designed and taught a course in Optimization for Mathematics and the Management Dept., and been organizer of a joint seminar in mathematics and physics and colloquium speaker in engineering departments.

**Jorgensen's collaborators in the past 48 months** (* indicates coeditor)

L. Baggett (U. Colorado), O. Bratteli (U. Oslo, Norway), D.E. Dutkay (Rutgers), D. Han* (UCF), C. Heil* (GATECH), K.H. Kim (Alabama State), D. Kribs (U. Guelph), D. Larson* (Texas A&M), K. Merrill (Colorado Coll.), A. Mohari (S.N. Bose Centre, Kolkata, India), P.S. Muhly* (U. Iowa), V. Ostrovs'kyĭ (N.A.S. Ukraine), J. Packer (U. Colorado), A. Paolucci (U. Leeds, U.K.), G. Price* (USNA), D.P. Proskurin (N.A.S. Ukraine), F. Roush (Alabama State), Yu. S. Samoĭlenko (N.A.S. Ukraine), Y. Wang (GATECH), A.I. Zayed* (DePaul).

**Jorgensen's advisors**

Graduate advisor: N. S. Poulsen (Denmark)          Postdoctoral advisor: R. V. Kadison (U. Penn.)

**Jorgensen's advisees**

*Ph.D. students in last 5 years:* Ilona Svidersky (2003), Paul Johnson (2003), Dylmoon Hidayat (2003), Maria G. Viola (2003), Kurao Watabe (2004), Myung-Sook Ahn (2004), Dorin E. Dutkay (2005), Myung-Sin Song (2005), and Ionut Chifan, Le Gui, Scott Taylor, Alvaro Correa Rosado, Christian Roldan-Santos, Ko Woon Um, J.P. LaForge, Feng Tian, and YangHo Choi, in progress. *Postdoctoral scholars in last 5 years:* David Kribs (2000–02; U. Guelph), Fernando Souza (2002–03; Toledo, OH), A. Mohari (S.N. Bose Centre, Kolkata, India). *Summary:* During the past 5 years, 16 Ph.D. students and 3 postdocs (not counting former PhD students, several of whom I continued to supervise); in earlier years (U.S.), 11 Ph.D. students (total 27) and 8 postdocs (total 11).

**Selection of Jorgensen's research publications** (co-authors in parentheses) [M.R. numbers in brackets]

1. *Analysis and Probability: Wavelets, Signals, Fractals*, under contract for publication in the *Graduate Texts in Mathematics* series, vol. 234, Springer-Verlag, New York, 2006, approx. 320 p., 42 illus., hardcover, ISBN 0-387-29519-4.
2. (with L.W. Baggett, K.D. Merrill, and J.A. Packer) A non-MRA $C^r$-frame wavelet with rapid decay, *Acta Appl. Math.* **89** (2006), 251–270.
   http://arxiv.org/abs/math.CA/0504394
3. (with D.E. Dutkay) Hilbert spaces built on a similarity and on dynamical renormalization, *J. Math. Phys.* **47** (2006), no. 5, 20 pp.
   http://arxiv.org/abs/math.DS/0503343
4. (with D.E. Dutkay) Harmonic analysis and dynamics for affine iterated function systems (TeX manuscript, 26 pages), *Houston J. Math.*, to appear.
   http://arxiv.org/abs/math.DS/0502277
5. (with D.E. Dutkay) Methods from multiscale theory and wavelets applied to non-linear dynamics, *Wavelets, Multiscale Systems and Hypercomplex Analysis* (D. Alpay, ed.), Oper. Theory Adv. Appl., vol. 167, Birkhäuser, Boston, 2006, pp. 87–126.
   http://arxiv.org/abs/math.DS/0411371
6. (with D.E. Dutkay) Wavelet constructions in non-linear dynamics (TeX manuscript, 13 pages), *Electron. Res. Announc. Amer. Math. Soc.* **11** (2005), 21–33.

7. (with D.E. Dutkay) Iterated function systems, Ruelle operators, and invariant projective measures (TEX manuscript, 36 pages), *Math. Comp.*, to appear (accepted July 2005, publication expected 2006).
http://arxiv.org/abs/math.DS/0501077

8. (with D.E. Dutkay) Disintegration of projective measures (TEX manuscript, 8 pages), *Proc. Amer. Math. Soc.*, to appear.
http://arxiv.org/abs/math.CA/0408151

9. (with D.E. Dutkay) Hilbert spaces of martingales supporting certain substitution-dynamical systems, *Conform. Geom. Dyn.* **9** (2005), 24–45. [2006a:37005]

10. (with D.E. Dutkay) Martingales, endomorphisms, and covariant systems of operators in Hilbert space (TEX manuscript, 44 pages), *J. Operator Theory*, to appear (accepted November 2005, publication expected 2007).
http://arXiv.org/abs/math.CA/0407330

11. Duality principles in analysis, *Wavelets and frames* (Oberwolfach mini-workshop, Feb. 15–21, 2004), Report no. 10/1004, Mathematisches Forschungsinstitut Oberwolfach, Germany, 2004, pp. 509–510.

12. Certain representations of the Cuntz relations, and a question on wavelets decompositions (TEX manuscript, 24 pages), accepted for *Operator Theory, Operator Algebras, and Applications* (Deguang Han, Palle Jorgensen, and David R. Larson, eds.), Contemp. Math., American Mathematical Society, Providence, to appear 2006.
http://arXiv.org/abs/math.CA/0405372

13. Iterated function systems, representations, and Hilbert space, *Internat. J. Math.* **15** (2004), 813–832. [2005h:28021]

14. Measures in wavelet decompositions, *Adv. Appl. Math.* **23** (2005), 561-590.

15. (with D.P. Proskurin and Yu. S. Samoĭlenko) On $C^*$-algebras generated by pairs of $q$-commuting isometries, *J. Phys. A: Math. Gen.* **38** (2005), 2669–2680. [2005m:46093]

16. Use of operator algebras in the analysis of measures from wavelets and iterated function systems (TEX manuscript, 14 pages), accepted for *Operator Theory, Operator Algebras, and Applications* (Deguang Han, Palle Jorgensen, and David R. Larson, eds.), Contemp. Math., American Mathematical Society, Providence, to appear 2006.
http://arxiv.org/abs/math.CA/0312212

17. (with L.W. Baggett, K.D. Merrill, and J.A. Packer) Construction of Parseval wavelets from redundant filter systems, *J. Math. Phys.* **46** (2005), no. 8, 19 pp.
doi:10.1063/1.1982768
http://arXiv.org/abs/math.CA/0405301

18. (with L.W. Baggett, K.D. Merrill, and J.A. Packer) An analogue of Bratteli-Jorgensen loop group actions for GMRA's, *Wavelets, Frames, and Operator Theory* (Focused Research Group Workshop, College Park, Maryland, January 15–21, 2003) (C. Heil, P.E.T. Jorgensen, and D. Larson, eds.), Contemp. Math., vol. 345, American Mathematical Society, Providence, RI, 2004, pp. 11–25.
http://arxiv.org/abs/math.OA/0308131

19. (with D.E. Dutkay) Wavelets on fractals, *Rev. Mat. Iberoamericana* **22** (2006), 131–180.
http://arXiv.org/abs/math.CA/0305443

20. (with D.P. Proskurin and Yu. S. Samoĭlenko) Generalized canonical commutation relations: Representations and stability of universal enveloping $C^*$-algebra, *Symmetry in Nonlinear Mathematical Physics*, Part 2 (Kyiv, 2001) (A.G. Nikitin, V.M. Boyko, and R.O. Popovych, eds.), Proceedings of the Institute of Mathematics of the Ukrainian National Academy of Sciences: Mathematics and Its Applications, vol. 43, Natsīonal′na Akademīya Nauk Ukraïni, Īnstitut Matematiki, Kiev, 2002, pp. 456–460. [2003j:81093]

21. Closed subspaces which are attractors for representations of the Cuntz algebras, *Current Trends in Operator Theory and Its Applications* (Blacksburg, VA, 2002) (J.A. Ball, J.W. Helton, M. Klaus, and L. Rodman, eds.), Oper. Theory Adv. Appl., vol. 149, Birkhäuser, Basel, 2004, pp. 223–253. [2005g:46105]

22. The existence problem for dynamics of dissipative systems in quantum probability *J. Math. Phys.* **45** (2004), 3605–3619. [2005h:82074]

23. (with A. Paolucci) Multiresolution wavelet analysis of Bessel functions of scale $\nu + 1$ (TEX manuscript, 19 pages), under revision, being prepared for submission.
http://arXiv.org/abs/math.FA/0006103

24. (with O. Bratteli) Convergence of the cascade algorithm at irregular scaling functions, *The Functional and Harmonic Analysis of Wavelets and Frames* (San Antonio, 1999) (L.W. Baggett and D.R. Larson, eds.), Contemp. Math., vol. 247, American Mathematical Society, Providence, RI, 1999, pp. 93–130. [2001f:42057]

25. (with O. Bratteli and V. Ostrovs'kyǐ) Representation Theory and Numerical AF-invariants: The Representations and Centralizers of Certain States on $\mathcal{O}_d$, *Mem. Amer. Math. Soc.* **168** (2004), no. 797, 178 pp. [2005i:46069]
http://arXiv.org/abs/math.OA/9907036

26. Unitary Matrix Functions, Wavelet Algorithms, and Structural Properties of Wavelets, Contribution by Palle E. T. Jorgensen to the Tutorial Sessions, Program: "Functional and harmonic analyses of wavelets and frames," 2–12 August 2004, Singapore, accepted for publication for a book series of World Scientific, Proceedings of the Special Year 2004 in Wavelets at the National University of Singapore (Z. Shen, ed.)
http://arxiv.org/abs/math.CA/0403117

27. (co-editor with D. Han and D.R. Larson) *Operator Theory, Operator Algebras, and Applications*, The 25th Great Plains Operator Theory Symposium (U. of Central Florida, 2005), Contemp. Math., American Mathematical Society, Providence, RI, to appear 2006.

28. (co-editor with G. Price, P.S. Muhly, and B.M. Baker) *Advances in Quantum Dynamics*, AMS-IMS-SIAM Joint Summer Research Conference (Mount Holyoke, 2002), Contemp. Math., vol. 335, American Mathematical Society, Providence, RI, 2003, 328 pp.

29. (co-editor with C. Heil and D.R. Larson) *Wavelets, Frames, and Operator Theory* (Focused Research Group Workshop, College Park, Maryland, January 15–21, 2003), Contemp. Math., vol. 345, American Mathematical Society, Providence, RI, 2004, 342 pp.

30. (w/ O. Bratteli, K.H. Kim, F. Roush) Computation of isomorphism invariants for stationary dimension groups, *Ergodic Theory Dynam. Systems* **22** (2002), 99–127.

31. (w/ D. Kribs) Wavelet representations and Fock space on positive matrices, *J. Funct. Anal.* **197** (2003), 526–559. [2004e:42055]

32. Diagonalizing operators with reflection symmetry, *J. Funct. Anal.* **190** (2002), 93–132. [2003e:47069]

33. (w/ A. Paolucci) Wavelets in mathematical physics: $q$-oscillators, *J. Phys. A* **36** (2003), 6483–6494.

34. (w/ O. Bratteli) *Wavelets through a Looking Glass: The World of the Spectrum*, Applied and Numerical Harmonic Analysis, Birkhäuser, Boston, 2002. [2003i:42001]

35. (w/ O. Bratteli, K.H. Kim, F. Roush) Decidability of the isomorphism problem for stationary AF-algebras and the associated ordered simple dimension groups, *Ergodic Theory Dynam. Systems* **21** (2001), 1625–1655. Corrigendum (only a fix of equation numbers): **22** (2002), 633. [2002h:46088]

36. Ruelle operators: Functions which are harmonic with respect to a transfer operator, *Mem. Amer. Math. Soc.* **152** (2001), no. 720, viii+60 pp. [2002c:46117]

37. Minimality of the data in wavelet filters, *Adv. Math.* **159** (2001), 143–228. [2002h:46092]

38. (w/ G. Ólafsson) Unitary representations and Osterwalder-Schrader duality, *The Mathematical Legacy of Harish-Chandra* (R. Doran, V. Varadarajan, eds.), Proc. Sympos. Pure Math., vol. 68, American Mathematical Society, Providence, 2000, pp. 333–401. [2001f:22036 Featured Review]

39. Off-diagonal terms in symmetric operators, *J. Math. Phys.* **41** (2000), 2337–2349. [2001a:47025]

40. Invited featured book review of *An Introduction to Wavelet Analysis* by David F. Walnut, Applied and Numerical Harmonic Analysis, Birkhäuser, 2002, *Bull. Amer. Math. Soc. (N.S.)* **40** (2003), 421–427.

41. Matrix factorizations, algorithms, wavelets, *Notices Amer. Math. Soc.* **50** (Sept. 2003), no. 8, 880–894. [2004g:42041]

42. (with D.P. Proskurin and Yu. S. Samoǐlenko) A family of ∗-algebras allowing Wick ordering: Fock representations and universal enveloping $C^*$-algebras, *Noncommutative Structures in Mathematics and Physics* (Kiev, 2000) (S. Duplij and J. Wess, eds.), NATO Science Series II: Mathematics, Physics and Chemistry, vol. 22, Kluwer Academic Publishers, Dordrecht, 2001, pp. 321–329.

43. Some second-order partial differential equations associated with Lie groups, *Geometric Analysis and Applications* (Canberra, 2000) (A. Isaev, A. Hassell, A. McIntosh, and A. Sikora, eds.), Proceedings of the Centre for Mathematics and Its Applications, vol. 39, The Australian National University, Canberra, 2001, pp. 149–159.

44. Representations of Cuntz algebras, loop groups and wavelets, *XIIIth International Congress on Mathematical Physics* (London, 2000) (A. Fokas, A. Grigoryan, T. Kibble, and B. Zegarlinski, eds.), International Press, Boston, 2001, pp. 327–332.

45. Compactly supported wavelets and representations of the Cuntz relations, II, *Wavelet Applications in Signal and Image Processing VIII* (San Diego, 2000) (A. Aldroubi, A.F. Laine, and M.A. Unser, eds.), Proceedings of SPIE, vol. 4119, SPIE, Bellingham, WA, 2000, pp. 346–355.

46. (with O. Bratteli) Wavelet filters and infinite-dimensional unitary groups, *Wavelet Analysis and Applications* (Guangzhou, China, 1999) (D. Deng, D. Huang, R.-Q. Jia, W. Lin, and J. Wang, eds.), AMS/IP Studies in Advanced Mathematics, vol. 25, American Mathematical Society, Providence, International Press, Boston, 2002, pp. 35–65. [2003e:94015]

47. (with D.P. Proskurin and Yu. S. Samoĭlenko) The kernel of Fock representations of Wick algebras with braided operator of coefficients, *Pacific J. Math.* **198** (2001), 109–122. [2002g:46117]

48. (with S. Pedersen) Commuting self-adjoint extensions of symmetric operators defined from the partial derivatives, *J. Math. Phys.* **41** (2000), 8263–8278. [2001k:47071]

49. (with G. Ólafsson) Quantum field theory, axioms for, *Encyclopaedia of Mathematics, Supplement II* (M. Hazewinkel, ed.), Kluwer Academic Publishers, 2000, pp. 393–394.

50. (with O. Bratteli, K.H. Kim, and F. Roush) Non-stationarity of isomorphism between AF algebras defined by stationary Bratteli diagrams, *Ergodic Theory Dynam. Systems* **20** (2000), 1639–1656. [2001k:46104]

51. (with Steen Pedersen) Spectral pairs in Cartesian coordinates, *J. Fourier Anal. Appl.* **5** (1999), 285–302. [2002d:42027]

52. (with O. Bratteli and D.E. Evans) Compactly supported wavelets and representations of the Cuntz relations, *Appl. Comput. Harmon. Anal.* **8** (2000), 166–196.

53. (with O. Bratteli, A. Kishimoto, and R.F. Werner) Pure states on $\mathcal{O}_d$, *J. Operator Theory* **43** (2000), 97–143. [2001b:46086]

54. (with Steen Pedersen) Orthogonal harmonic analysis of fractal measures, *Electron. Res. Announc. Amer. Math. Soc.* **4** (1998), 35–42. [99b:28008]

55. (with Steen Pedersen) Dense analytic subspaces in fractal $L^2$-spaces, *J. Analyse Math.* **75** (1998), 185–228. [2000a:46045]

56. (with O. Bratteli) Iterated function systems and permutation representations of the Cuntz algebra, *Mem. Amer. Math. Soc.* **139** (1999), no. 663, x+89 pp.[99k:46094a Featured Review]

57. (with S. Pedersen) Harmonic analysis of fractal measures, *Constr. Approx.* **12** (1996), 1–30. [97c:46091]

58. (with S. Pedersen) Harmonic analysis and fractal limit-measures induced by representations of a certain $C^*$-algebra, *J. Funct. Anal.* **125** (1994), 90–110. [95i:47067]

59. (with L.M. Schmitt and R.F. Werner) $q$-canonical commutation relations and stability of the Cuntz algebra, *Pacific J. Math.* **165** (1994), 131–151. [95g:46116]

60. (with L.M. Schmitt and R.F. Werner) Positive representations of general commutation relations allowing Wick ordering, *J. Funct. Anal.* **134** (1995), 33–99. [96h:81033]