CURRICULUM VITAE

Evangelos A. Coutsias
Born: 27 May 1953, Athens, Greece

Educational History:
Studies:

1971	Graduated from Varvakeios Normal School	Athens, Greece
1971-1972	Physics Department, National University	Athens, Greece
1972-1975	Physics Department, California Institute of Technology	Pasadena, CA
1975-1979	Applied Mathematics Department, California Institute of Technology	Pasadena, CA

Higher Degrees:

B.S.	1975	California Institute of Technology	Physics
Ph.D.	1979	California Institute of Technology	Applied Mathematics

Employment History

1976–1979	Research/Teaching Assistant	Department of Applied Mathematics California Institute of Technology, Pasadena, CA
1979–1985	Assistant Professor	Department of Mathematics and Statistics University of New Mexico, Albuquerque, NM
1982–1989	Consultant	Los Alamos National Laboratory, Los Alamos, NM
1983	Consultant	Mission Research Co., Albuquerque, NM
1985–1995	Associate Professor	Department of Mathematics and Statistics University of New Mexico, Albuquerque, NM
1987 Fall	Visiting Lecturer	Dept of Mathematics, SUNY at Buffalo, Buffalo, NY
1988–2001	Consultant	Risø National Laboratory, Roskilde, Denmark
1988 Spring	Visiting Assoc. Professor	Department of Mathematics, National University, Athens, Greece
1989–1990	Visiting Research Scientist	Department of Plasma Physics and Fluid Dynamics Risø National Laboratory, Roskilde, Denmark
1991	Senior Research Analyst	Phillips Laboratories, Albuquerque NM
1995–	Professor	Department of Mathematics and Statistics University of New Mexico, Albuquerque, NM
2000–	Visiting Professor	Department of Pharmaceutical Chemistry, Univ. of California in San Francisco , San Francisco CA

Research Expertise:

Asymptotics and singular perturbations, high fidelity numerical methods, especially spectral methods. The study of bifurcation and transition phenomena in fluids and plasmas by the blending of asymptotic, variational and numerical techniques. Vortex dynamics, the interaction of vortical structures with rigid walls and the formation and evolution of coherent vortices in forced shear layers and in decaying turbulent flows in wall bounded domains. More recent interests include the development of techniques for high-accuracy modeling of the structure of proteins and especially small ring peptides of relevance to drug discovery.

Professional Society Memberships (current):

Society for Industrial and Applied Mathematics American Chemical Society

Professional Experience-Select committees

1992–1995	Organizer	Joint UNM – CNLS-Los Alamos Lecture Series on Nonlinear Science
1997–2000	Chair, Undergraduate Committee	Department of Mathematics, UNM
1997–2000	Member, Steering Committee	Center for Advanced Study University of New Mexico
2002–2004	Member, Steering Committee	High Performance Computing Center University of New Mexico
2003–	Member, Steering Committee	Consortium of the Americas for Interdisciplinary Science, University of New Mexico

Advanced Study:

Summer Schools

Integrable Systems,
American Mathematical Society, Laramie, Wyoming, June 20–July 10, 1984

Recent Advances in Geophysical and Astrophysical Turbulence,
National Center for Atmospheric Research, Boulder, Colorado, June 1–27, 1987

Workshops

Mathematical Problems posed by Anisotropic Materials,
American Mathematical Society, Bowdoin, Maine, July 22–30, 1988

Asymptotics Beyond all Orders,
NATO Workshop, Sand Diego, California, January 10-14, 1991

Honors

1971, 1972	Scholarship Recipient	National University, Athens, Greece
1975-1976	Caltech Graduate Fellowship	California Institute of Technology
1993	Excellence in Teaching Award	NASA Minorities in Engineering Scholarship Program

PUBLICATIONS:

Doctoral Dissertation
Some effects of spatial nonuniformities in chemically reacting mixtures, thesis, Calif. Inst. of Technology, (1979). Advisor: D.S. Cohen.

Publications:

A **Peer Reviewed**

a **Submitted for publication**

1 E. A. Burroughs, E. A. Coutsias, and L. A. Romero, *A reduced-order partial differential equation model for dynamics of the flow in a thermosyphon*, submitted to Journal of Fluid Mechanics, (Nov. 2004).

2 B. Ho, E. A. Coutsias, C. Seok and K. A. Dill, *The flexibility of the proline ring*, submitted to Protein Science, (Sep. 2004).

b **Journal Articles**

1 E.A. Coutsias, C. Seok and K.A. Dill, *Using quaternions to calculate RMSD*, Journal of Computational Chemistry, 2004, vol 25, pp 1849-1857.

2 E. A. Coutsias, C. Seok, M. P. Jacobson and K. A. Dill, *A Kinematic View of Loop Closure*, Journal of Computational Chemistry, 2004, vol 25, pp 510-528.

3 D. Sheltraw and E.A. Coutsias, *Invertibilty of Current Density from Near-Field Electromagnetic Data*, J. Applied Phys, v94, n8, pp. 5307-5315 (2003).

4 H.J.H. Clercx, A.H. Nielsen, D.J. Torres and E.A. Coutsias, *Two-dimensional turbulence in square and circular domains with no-slip walls*, European J. of Mechanics B - Fluids 20(2001), 557-576.

5 L. Ketai, C.M. Coutsias, S. Williamson and E.A. Coutsias, *Thin–Section CT Evidence of Bronchial Thickening in Children with Stable Asthma: Bronchoconstriction or Airway Remodeling?*, Academic Radiology, 8(3), p.257-264, (2001).

6 K. Bergeron, E.A. Coutsias, J.P. Lynov and A.H. Nielsen, *Dynamical properties of forced shear layers in an annular geometry*, Journal of Fluid Mechanics, 402, p.255-289, (2000).

7 J.P. Lynov, K. Bergeron, E.A. Coutsias and A.H Nielsen, *An accurate and efficient spectral method for studies of the dynamical properties of forced, circular shear layers*, Applied Numerical Mathematics, 33, p.175-181, (2000).

8 D.J. Torres and E.A. Coutsias, *Pseudospectral Solution of the Two-Dimensional Navier-Stokes Equations in a Disk*, SIAM Journal on Scientific Computing, 21(1), 378-403 (1999).

9 E.A. Coutsias and N.D. Kazarinoff, *The Approximate Functional Formula for the Theta Function and Diophantine Gauss Sums*, Transactions of the AMS, 350(2), p.615-641, (1998).

10 E.A. Coutsias, M. Wester and A.S. Perelson, *A Nucleation Theory of Cell Surface Capping*, J. Statistical Physics, 87(5/6) p.1179-1203, (1997).

11 E.A. Coutsias, T. Hagstrom and D. Torres, *An efficient spectral method for ordinary differential equations with rational function coefficients*, Mathematics of Computation, **65** (216), 611-635, (1996).

12 K. Bergeron, E.A. Coutsias, J.P. Lynov and A.H. Nielsen. *Self Organization in 2D Circular Shear Layers*, Physica Scripta T67, 1996, p. 33-37.

13 E.A. Coutsias, T. Hagstrom, J.S. Hesthaven and D. Torres, *Integration preconditioners for differential operators in spectral τ-methods*, Houston Journal of Mathematics, 1996, Special Issue (Proceedings of ICOSAHOM 3, Andrew V. Ilin and L. Ridgway Scott, Eds.), p. 21-38.

14 E. A. Coutsias, J. S. Hesthaven and J. P. Lynov, *An accurate and efficient spectral tau method for the Navier-Stokes equations in a planar channel*, Houston Journal of Mathematics, 1996, Special Issue (Proceedings of ICOSAHOM 3, Andrew V. Ilin and L. Ridgway Scott, Eds.), p. 39-54

15 G. Harel, G. Kurizki, J.K. McIver and E.A. Coutsias, *Optimized preparation of quantum states by conditional measurement*, Phys. Rev. A. 53(6), June 1996, p. 4534–4538.

16 B.S. Masson and E.A. Coutsias *Acoustic Wave nonlinearity in stimulated Brillouin scattering* , J.Opt.Soc.Am., B, 1367-1373, (1994).

17 H.L. Pécseli, E.A. Coutsias, T. Huld, J.P. Lynov, A.H. Nielsen and J. Juul Rasmussen *Coherent vortical structures in two-dimensional plasma turbulence*, Plasma Phys. Contr. Fusion, **34**, 2065-2070, (1992).

18 E.A. Coutsias and J.P. Lynov. *Fundamental interactions of vortical structures with boundary layers in two-dimensional flows*, Physica D51, 482-497, (1991).

19 E.A. Coutsias, F.R. Hansen, T. Huld, G. Knorr and J.P. Lynov. *Spectral methods for numerical plasma simulation Physica Scripta*, 40, 270-279, (1989).

20 E.A. Coutsias. *Caustics and virtual cathodes in electron beams* J. Plasma Phys., 40(2), 369-384, (1988).

21 E.A. Coutsias and N.D. Kazarinoff. *Disorder, renormalizability, theta functions and cornu spirals* Physica, 26D, 295-310, (1987). (reviewed in Math. Reviews, MR 88h#11056 CMP 892 449 by M. Mendes-France)

22 A.S. Perelson and E.A. Coutsias. *A moving boundary model of acrosomal elongation* J. Math. Biology, 23, 361-379, (1986).

23 E.A. Coutsias and J.K. McIver. *Non relativistic Kapitza-Dirac scattering* Phys. Rev. A, 31, 3155-3168, (1985).

24 E.A. Coutsias. *Effects of thermal spread on the space charge limit of an electron beam* J. Plasma Phys., 31, 313-320, (1984).

25 E.A. Coutsias and J.C. Neu. *The aging of nuclei in a binary mixture* Physica, 12 D, 295-302, (1984).

26 E.A. Coutsias and D.J. Sullivan. *Space charge limit instabilities in electron beams* Phys. Rev. A, 27, 1535, (1983).

27 E.A. Coutsias and B.A. Huberman. *Long-time behavior of Ginzburg-Landau systems far from equilibrium* Physical Rev. B, 24, 2592, (1981).

28 D.S. Cohen, E.A. Coutsias and J.C. Neu. *Stable oscillations in single species growth models with hereditary effects* Mathematical Biosciences, 44, 255-268, (1979).

c **Edited Volumes**

1 P.M. Alsing, E.A. Coutsias and J.C. McIver, The Interfacial Behavior of Liquid Water Near Hydrophobic Surfaces: A Parallel Force Decomposition Molecular Dynamics Code, in *Applications of High-Performance Computing in Engineering VI*, Eds. M. Ingber, C.A. Brebbia and H. Power, WIT Press, Southampton, Boston (2000), p.81-90.

2 E.A. Coutsias, J.P. Lynov, A.H. Nielsen, M. Nielsen, J.Juul Rasmusen and B. Stenum. *Vortex Dipoles Colliding with Curved Walls Proc. of "Future Directions in Physical and Biological Systems"*, Lyngby, Denmark, P.L. Christiansen, J.C. Eilbeck, and R.D. Parmentier, eds., Plenum Press, New York, 51-54, (1992).

3 J.P. Lynov, E.A. Coutsias, and A.H. Nielsen. *A spectral algorithm in the vorticity - stream function formulation for two-dimensional flows with no- slip walls Computational Fluid Dynamics '92*, Vol. 1, Ch. Hirsch, J. Periaux, and W. Kordulla, eds., Elsevier Science Publishers B.V., 413-420, (1992).

4 E.A. Coutsias and H. Segur, *A new formulation for dendritic crystal growth in two space dimensions Asymptotics beyond All Orders*, H. Segur, H. Levin and S. Tanveer, eds., Plenum Press, New York, 87-104, (1991).

5 N.D. Kazarinoff and E.A. Coutsias. *On cornu spirals, disorder, self-similarity, and Jacobi's $\theta_3(U, \tau)$ Bifurcation: Analysis, Algorithms, Applications*, Vol. 79 in International Series of Numerical Mathematics, T. Küpper, R. Seydel, K. H. Troper, eds., Birkhäuser, Berlin, 139-152, (1987).

6 T. Bountis and E.A. Coutsias. *On an application of perturbation methods to the Beam-Beam Interaction* Proceedings of the Symposium on Nonlinear Dynamics and the Beam-Beam Interaction, March 19-21,1979, E. Herrera and M. Month, eds., APS, Brookhaven National Laboratory, 53-61, (1980).

d **Book Chapters**

1 D.J. Sullivan, J.E. Walsh and E.A. Coutsias. *Virtual cathode oscillator (Vircator) theory High-Power Microwave Sources*, Ch.13, V.L. Granatstein and I. Alexeff, eds., Artech House, Boston, 441-505, (1987).

B **Conference Proceedings Contributions**

1 A.H. Nielsen, D.J. Torres and E.A. Coutsias. *Decaying two-dimensional Turbulence in Bounded Flows*, 1998 International Consortium on Plasma Physics (ICPP) and 25th European Physical Society (EPS) Conference on Controlled Fusion and Plasma Physics, Praha, 29 June–3 July, ECA Vol. 22C(1998), 2346–2349.

2 J.P. Lynov, E.A. Coutsias and J.S Hesthaven. *New spectral algorithms for accurate simulations of bounded flows*, Proceedings of Eurotherm Seminar 36, "Advanced Concepts and Techniques in Thermal Modelling", Poitier, France, Sep. 21-23 (1994), pp. N16–N21.

3 E.A. Coutsias, K. Bergeron, J.P. Lynov and A.H. Nielsen. *Self Organization in 2D Circular Shear Layers* American Institute of Aeronautics and Astronautics (AIAA) Paper 94-2407, 25th Plasmadynamics and Lasers Conference, June 20-23, 1994, Colorado Springs, CO, p.1-12.

4 E.A. Coutsias, T. Huld and J.P. Lynov. *Numerical studies of the evolution of coherent structures in two-dimensional shear flow*, Preprint volume of the Ninth Symposium on Turbulence and Diffusion, April 30-May 3, 1990, Roskilde, Denmark, Published by the American Meteorological Society, Boston, MA, 212-215.

5 D.J. Sullivan and E.A. Coutsias. *Virtual cathode formation in electron beams as a bifurcation phenomenon High Power Beams '81*, Proceedings, 4th International Topical Conference on High-Power Electron and Ion-Beam Research and Technology, H.J. Doucet and J.M. Buzzi, Eds., Ecole Polytechnique, Paris, France, 371-378, June 29-July 3, 1981.

C **To be submitted**

1 D. Sheltraw and E.A. Coutsias, *Inverse Magnetometry on thin conducting shells*, To be submitted (2004).

2 M. H. Adhikarri, E. A. Coutsias, and J. K. McIver, *A spectral method for the accurate solution of certain stiff delay-differential equations*, To be submitted (2004).

3 G. von Winckel, E. A. Coutsias, and S. Krishna, *Spectral element modeling of semiconductor heterostructures*, To be submitted (2004).

D **Select unpublished writings**

1 E. A. Coutsias and P.A. Alsing, *Numerical Integration Scheme for md_serial.f*, manual for the molecular dynamics algorithm *md_serial.f* developed for the simulation of water near hydrophobic surfaces, summer 2000.

2 E.A. Coutsias and L. Romero, *The Quaternions with an application to Rigid Body Dynamics*, Sandia National Laboratories, Technical Report SAND2004-0153, 2004.

Select invited talks/presentations to professional meetings and seminar or colloquia assemblies (since 1987):

1. The approximate functional formula for the theta function
   Colloquium, Department of Mathematics, SUNY at Buffalo, February 1987.

2. Gauss Sums and repeated renormalization
   Colloquium, Department of Mathematics, SUNY at Buffalo, October 1987.

3. On singular solutions of the Euler equations
   Applied Mathematics Seminar, SUNY at Buffalo, November 1987.

4. Three-dimensional singularities of the Euler equations
   Colloquium, Department of Plasma Physics, Risø National Laboratory, Denmark, February 1988.

5. A spectral algorithm for the Navier–Stokes equation in 2d bounded geometries in the vorticity–stream function formulation
   Invited talk given at the Meeting on Theory and Numerical Methods for Initial – Boundary Value Problems, Oberwolfach, F.R.G., December 1989.

6. Nonlinear Phenomena in Mathematical Physics
   Colloquium, Department of Physics, Risø National Laboratory, Denmark, January 1990.

7. A dynamic criterion for dendritic crystal growth
   Invited talk at the Spring Meeting of the Danish Physical Society, Nyborg, Denmark, May 1990.

8. A spectral algorithm for the Navier-Stokes equations in 2-d bounded geometries
   Colloquium, Los Alamos National Laboratories, New Mexico, September 1990.

9. A spectral algorithm for the Navier-Stokes equations in 2-d bounded geometries
   Applied Mathematics Seminar, UNM Department of Mathematics and Statistics, October 1990.

10. A new formulation of dendritic crystal growth in two space dimensions
    Invited talk at the NATO workshop on *Asymptotics Beyond all Orders*, San Diego, CA, January 10-14, 1991.

11. A spectral algorithm for the Navier-Stokes equations in 2-d bounded geometries
    Invited talk at the monthly meeting of the New Mexico chapter of SIGNUM, Albuquerque, NM, February 1991.

12. A spectral algorithm for the Navier-Stokes equations in 2-d bounded geometries
    Colloquium, UNM Department of Mechanical Engineering, February 1991.

13. Weak solutions of the Euler equations
    Applied Mathematics Seminar, UNM Department of Mathematics and Statistics, April 1992.

14. A new formulation of dendritic crystal growth in two space dimensions
    Invited talk at the Annual Meeting of the American Institute of Chemical Engineers, special session on Crystal Growth, Miami, November 1992.

15. Instabilities in Circular Shear Flows
    Colloquium, Department of Optics and Fluid Dynamics, Risø National Laboratory, Denmark, December 16, 1992.

16. Integration operators and the efficient spectral solution of linear ODE with rational function coefficients
    Invited poster presentation, DOE-Sandia meeting, Albuquerque, NM, February 1993.

17. Maximum entropy and fluid flow
    Information Physics seminar, UNM Physics Department, March 1993.

18. Self Organization in 2D Circular Shear Layers
    Invited talk, 25th AIAA Plasmadynamics and Lasers Conference, Colorado Springs, CO, June 20-23, 1994.

19. Cornu spirals and Renormalization
    Applied Mathematics Colloquium, Department of Mathematics, University of Arizona, Tucson, October 14, 1994.

20. Diophantine Gauss Sums, Self-similarity and Renormalization
    9th Conference and Summer School on Complexity, University of Thrace, Xanthi, Greece, July 17 - 28, 1995.

21. The Dynamics of Circular shear layers,
    Center for Advanced Study, University of New Mexico, September 1998.

22. Bifurcations in rotating flows,
    Applied Mathematics Division, Sandia National Laboratory, February 1999.

23. The inverse problem of Magnetoencephalography (MEG),
    Department of Applied Mathematics, Brown University, Providence, Rhode Island, April 14, 2000.

24. Computing at high Reynolds numbers in a Disk,
    Seminar, The Graduate School in Nonlinear Science, Risø National Laboratory, Roskilde, Denmark, May 15, 2001.

25. Geometrical modeling of Proteins,
    Workshop on Dynamics of Assorted Systems Across Disciplines, UNM Consortium of the Americas for Interdisciplinary Science, November 15, 2002.

26. Exact Loop Closure in Proteins,
    Poster Presentation, UCSF Department of Pharmaceutical Chemistry, Biophysics/Computational Cell Biology Retreat at Asilomar, December 8-10, 2002.

27. Exact Analytical Formulation for Coordinated Motion in Polypeptide Chains,
    Applied Mathematics Division, Sandia National Laboratory, April 3, 2003.

28. Exact Analytical Formulation for Coordinated Motion in Polypeptide Chains,
    Health Sciences, UNM, Biocomputing Day, April 4, 2003.

29. A Kinematic View of Loop Closure, (Invited talk), Symposium on Symbolic calculation in chemistry, American Chemical Society, National Meeting, Philadelphia, August 26, 2004.

Contributed (unrefereed) abstracts and/or oral presentations at professional meetings (since 1987):

1. The approximate functional formula for the theta function
   E.A. Coutsias and N.D. Kazarinoff
   Mathematical Association of America

Albuquerque meeting
March 1987.

2. Numerical studies of electrostatic turbulence in two-dimensional bounded geometries
E.A. Coutsias, T. Huld and J.P. Lynov
The 25th Nordic Plasma and Gas Discharge Symposium
Gausdal, Norway
February 1990.

3. Interactions of vortical structures with walls in plane, parallel shear flows (poster)
E.A. Coutsias and J.P. Lynov
Danish Physical Society, Spring Meeting
Nyborg, Denmark
May 1990.

4. Interactions of vortical structures with walls in plane, parallel shear flows (poster)
E.A. Coutsias and J.P. Lynov
The 10th annual CNLS conference *Nonlinear Science – The Next Decade*
Los Alamos, NM
May 1990.

Research funding:

TEACHING EXPERIENCE:

Ph.D. advisement/direction:

Victor Espino Ph.D., University of New Mexico, 1987
"On point vortex solutions of the Euler equations."
Keith Bergeron Ph.D., University of New Mexico, 1993
"The evolution of two dimensional circular shear layers."
David Torres Ph.D., University of New Mexico, 1995
"Integration operators in spectral methods".
Robert Wolverton Ph.D., University of New Mexico, 2001
" Shear layer instability in a 2-dimensional disk".
Elizabeth Burroughs Ph.D., University of New Mexico, 2003
"Convection in a thermosyphon: bifurcation and stability analysis".

New course introduced

Introduction to Singular perturbations, Math. 570, introduced in the Fall semester, 1981, taught biannually since then.

Select Graduate Seminars (co-organized)

1985–1986	Geometrical Theory of Ordinary Differential Equations
1986-1987	Mathematical Methods of Mechanics
1992-1994	Navier-Stokes Equations
1998-2000	Nonlinear Dynamics, Bifurcation and Stability

Graduate Courses (times taught)

Applied Matrix Theory	(6)
Numerical Linear Algebra	(4)
Introduction to Singular Perturbations	(4)
Ordinary Differential Equations	(3)
Partial Differential Equations	(3)
Mathematical Theory of Turbulence	(1)
Boundary Value Problems I	(1)
Boundary Value Problems II	(1)
Complex Variables	(2)
Numerical Analysis	(3)
Numerical Partial Differential Equations	(1)
Introduction to Spectral Methods	(1)
Mathematical Methods of Classical Mechanics	(2)
Introduction to Solitons	(1)
Introduction to Nonlinear Waves	(2)

Undergraduate Courses (times taught)

Ordinary Differential Equations	(16)
Partial Differential Equations	(4)
Vector Analysis	(8)
Complex Variables	(3)
Numerical Analysis	(4)
Linear Algebra	(10)
Calculus I	(2)
Calculus II	(2)
Calculus III	(3)

Workshops (designed and taught)

"Microcomputers in the Classroom": two-week workshops on educational applications of microcomputer systems, offered in June 1980, 1981 and 1982 through the UNM Southwest Resource Center with the purpose of training teachers in minority schools in the educational uses of microcomputers. (with R.M. Schrader).

Other Professional Activities

Journal reviewing

1980–	Occasional reviewer for SIAM Journal of Applied Mathematics
1987–	Occasional reviewer for Physica D
1989–	Occasional reviewer for Physica Scripta
1995–	Occasional reviewer for SIAM Journal of Scientific Computing
1999–	Occasional reviewer for SIAM Journal of Numerical Analysis
2003–	Occasional reviewer for Journal of Computational Physics
2003–	Occasional reviewer for IEEE Journal

Meetings organized

Co-Chairman (with J.R. Mueller), Special Session on Singular Perturbations, 807th Annual Meeting of Am. Math. Soc., San Luis Obispo, California, November 10-12, 1983

Refereeing for professional societies and organizations

1992–	Occasional reviewer for Department of Energy
1993–	Occasional reviewer for Petroleum Research Fund
1993–	Occasional reviewer for the National Science Foundation