Curriculum vitæ

Charles L. Epstein
Thomas A. Scott Professor of Mathematics

January 10, 2014

1 General information

Permanent address:	University of Pennsylvania
	Department of Mathematics
	209 S. 33$^{\text{rd}}$ St. Phila., PA 19104–6395, U.S.A.
Telephone:	215-898-8476
Fax:	215-573-4063
E-mail:	cle@math.upenn.edu
Web-page:	http://www.math.upenn.edu/~cle

2 Education

1974–78	MIT, Department of Mathematics
	SB, February 1978
1978–79	MIT, Graduate Department of Mathematics
1979–83	Courant Institute, New York University
	MS, June 1981
	PhD, June 1983
Thesis title:	Spectral Theory of Geometrically Periodic Hyperbolic 3–manifolds
Doctoral: Advisor	Professor Peter D. Lax, New York University
Postdoctoral: Advisor	Professor William P. Thurston, Princeton University

3 Academic Positions

2013–	Affiliated faculty of Warren Center in Network and Data Sciences, University of Pennsylvania
2008–	Thomas A. Scott Professor of Mathematics, University of Pennsylvania
2008–	Member, Graduate group in Genomics and Computational Biology,

The School of Medicine, University of Pennsylvania

2008– Graduate Group Chair in Applied Mathematics and Computational Science

2007– Member, Institute for Medicine and Engineering, University of Pennsylvania

2005–2008 Professor of Radiology in Mathematics, Department of Radiology,
School of Medicine, University of Pennsylvania

2002–2007 Francis J. Carey Term Chair in Mathematics, University of Pennsylvania

2001– Member, Graduate group in Bioengineering, University of Pennsylvania

1993– Professor, Department of Mathematics, University of Pennsylvania

1989–93 Associate Professor, Department of Mathematics, University of Pennsylvania

1985–89 Assistant Professor, Department of Mathematics, University of Pennsylvania

1983–86 Instructor and NSF postdoctoral fellow, Department of Mathematics, Princeton University

4   Temporary Positions

June 1985	Member of S.F.B. 170, Math. Inst., Göttingen, Germany
Spring 1986	Member of M.S.R.I., Berkeley, CA
1989–90	Visiting Scholar, Department of Mathematics, MIT
June 1990	Member of S.F.B. 170, Math. Inst., Göttingen, Germany
1991–5	Associate Editor, *Bulletin of the A.M.S.*
1994–5	Member of I.H.E.S., Bures–sur–Yvette, France.
February 1995	Member of S.F.B. 170, Math. Inst., Göttingen, Germany
June, 1995	Visitor, Forschungsinstitut für Mathematik ETH, Zürich.
November, 1995	Member of M.S.R.I., Berkeley.
May, 1996	Visiting Lecturer, Inst. für Mathematik Univ. Bern.
May, 1997	Visiting Prof., University of Paris, VI.
October, 1997	Visiting Member, Fields Institute, Toronto.
June, 1999	Visiting Prof., University of Paris, VI.
July, 1999	Visiting Prof., C.I.R.M., Marseilles.
January, 2001–June, 2007	External Editor, *Jour. Inst. Math. Jussieu.*
September, 2001–April, 2002	Visitor, Institute for Advanced Studies, Princeton, NJ.
July, 2002–June, 2003	Visiting Prof., Department of Radiology, HUP.
April, 2004–	Series editor, *Cornerstones in Mathematics*, Birkhäuser.
June, 2005	Visiting Prof., University of Paris, VI.
January, 2007–December, 2012	Member of the editorial board of *Inverse Problems*.
February, 2008–January, 2011	Member-at-Large of the American Mathematical Society Committee on the Profession.
February, 2009–January, 2011	Member-at-Large of the American Mathematical Society Committee on Committees.
June, 2011–	Visiting Member, London Institute of Mathematical Sciences
September 2011-June 2012	Visitor, Courant Institute.
February, 2012–	Member of the Editorial Advisory Board, Central European Journal of Math.
February, 2013–January, 2016	Member of AMS-ASA-MAA-SIAM Data Committee
February, 2014–January, 2016	Member-at-Large of the AMS Liaison Committee with AAAS

February, 2014–January, 2016   Member of AMS Committee to Select the Gibbs Lecturer
January, 2014–   Member of Scientific Advisory Board for the Institute for
Computational and Experimental Research in Mathematics (ICERM)

5 Awards, Fellowships, and Grants

1982–83	NYU Graduate School of Arts and Sciences dissertation fellowship
1983	K. O. Friedrichs prize for an excellent thesis
1983–86	NSF postdoctoral fellowship
July 1986	Investigator on NSF Grant DMS86–00338
July 1987	Investigator on NSF Grant DMS85–03302
July 1988–June 1990	Alfred P. Sloan research fellowship
July 1988–June 1990	Investigator on NSF Grant DMS87–22998
July 1988–June 1991	Young Faculty Award, Natural Science Association, University of Penn.
July 1990–June 1993	Principal Investigator, NSF Grant DMS90–01957
July 1993–June 1996	Principal Investigator, NSF Grant DMS93–01088
July 1996–June 1999	Principal Investigator, NSF Grant DMS96–23040
July 1999–June 2002	Principal Investigator, NSF Grant DMS99–70487
July 2002–June 2003	Principal Investigator, NSF Grant DMS02–07123
October 2002–June 2006	Principal Investigator, NSF Grant DMS02-03705
July 2003–June 2007	Investigator, NIH grant R01 AR50068-01 PI: Felix Wehrli
July 2003–June 2008	Preceptor, NIH training grant T32 EB000814-08 PI: Felix Wehrli
Spetember 2004-August 2006	Investigator, NIH grant R21 EB003951 PI: Felix Wehrli
September 2005–October 2009	Investigator, DARPA FUNBIO program PI: Simon Levin
July 2006–June 2012	Principal Investigator, NSF Grant DMS06-03973
July 2006–	Investigator, NIH Grant R01 EB006266, PI: James Gee
May 2007–April 2008	Principal Investigator, NSF Grant DMS06-53803
August 2009–August 2012	Co-investigator, NSF Grant DMS - 0935165 SOLAR: Programming the Self-Assembly of Matter for Solar Energy Conversion. PI: Chris Murray
September 2009–September 2011	Co-investigator, DARPA FUNBIO II program PI: Simon Levin
June 2012–May 2015	Principal Investigator, NSF grant DMS-1205851
October 2012–September 2015	Co-investigator, ARO grant W911NF-12-1-0552

6 Society memberships

MIT chapters of $\phi\beta\kappa$ and $\Sigma\Xi$
SIAM   AMS   AAAS

7 Selected Lectures

7.1 Invited talks at major international meetings

1986	MSRI, meeting in honor of Peter Lax's 60th birthday
1988	Meeting on microlocal analysis, Irsee, West Germany
1990	Plenary talk at the ICM satellite conference, *Zeta functions in geometry*, Tokyo, Japan
1993	Conference in honor of J. Hummel, U. of MD
1993	Conference in honor of Ralph Phillips 80th birthday, Stanford U.
1994	*Singularities in Geometry*, Academia Sinica, Beijing
1994	Principal speaker at *Conference on Singularities*, Kagoshima Japan
1994	*Conference on complex analysis and deformations of singularities*, Osaka, Japan
1995	*International conference on several complex variables*, Erwin Schrödinger Inst., Vienna
1995	*Workshop on several complex variables*, MSRI
1998	*Conference on Microlocal Methods in Mathematical Physics*, Fields Inst., Toronto
1999	*Midwest several complex variables*, Toronto
1999	*Woods Hole meeting on the Atiyah-Bott theorem*, Woods Hole, MA
1999	*Hayama symposium on several complex variables*, Hayama Japan
1999	*Microlocal analysis and scattering theory*, New College, FL
2000	*Several complex variables meeting*, Hong Kong
2000	*Meeting on contact and symplectic geometry*, Stanford, CA
2001	*MSRI-Evans colloquium*, Geometric scattering theory and elliptic theory on non-compact and singular spaces, MSRI, Berkeley, CA
2001	*Midwest several complex variables*, Ann Arbor, MI
2002	*Conference in honor of Richard B. Melrose's 25 Years at MIT*, Cambridge, MA
2002	Plenary talk at the ICM satellite conference on *Several Complex Variables*, Seoul, Korea
2002	*Conference in honor of R. Gunning's and J.J. Kohn's 70th birthdays*, Princeton, NJ
2003	*Conference in honor of Louis Boutet de Monvel*, University of Paris VI, Paris
2003	*Conference in honor of F. Alberto Grünbaum*, IMPA, Rio de Janeiro
2003	*Inverse Problems and Several Complex Variables*, Inst. Henri Poincare, Paris
2004	*Asymptotic and Effective Results in Complex Geometry*, JHU, Baltimore
2005	*Theoretical and Computational Aspects of Inverse Problems*, Annual meeting of the AMS, Atlanta, GA
2005	*Workshop on Analytic and Algebraic Methods in Complex and CR Geometry*, BIRS, Banff, Canada
2005	*Grand Challenges in Medical Image Processing*, Fields Institute, Waterloo, Canada
2006	*ICM-Madrid 2006 Satellite Conference: CR-Geometry and PDE*, Levico Terme, Italy
2007	*Midwest Several Complex Variables*, Ann Arbor, MI
2007	*Geometry Festival*, College Park, MD
2007	International Conference in honor of Gennadi M. Henkin, Paris, France
2008	Invited talk at the annual meeting of *International Society for Magnetic Resonance in Medicine*, Toronto, Canada
2009	Invited talk at *The Americas Conference on Differential Equations*, Veracruz, Mexico
2011	Invited talk in the *The Fritz John Lecture Series*, Courant Institute, New York
2011	Plenary Talk in *Conference on Mathematics of Medical Imaging*, MITACS, Toronto, CA
2012	Invited talk, *Workshop on Non-linear PDE*, Jaoa Pessoa, Brazil

2013   Invited talk, *110th Statistical Mechanics Conference*, New Brunswick, New Jersey
In honor of the 90th birthdays of Freeman Dyson and Philip Anderson

7.2 Lecture courses

1996   Month long course at University of Bern on *Embedding 3-dimensional CR-manifolds*
1998   Week of lectures on *Deformations of singularities*, Chinese University of Hong Kong
1999   Week of lectures on *Index theory for the Heisenberg calculus*, CIRM, Luminy, France
2001   Week of lectures on *CR-geometry* at U. Superior Tecnico, Lisbon Portugal
2005   Lecture series on *Indices and relative indices in CR-geometry* at
Universite Paul Sabatier, Toulouse, France
2006   Minicourse on *Microlocal methods for boundary value problems* at
The Fields Institute, Toronto, Canada
2010   Minicourse on *Magnetic Resonance Imaging* at MSRI, Berkeley, California
2012   Minicourse on *Eletromagnetic Theory and Computation* at the Fields Institute,
Toronto, Ontario
2014   Panelist at Springer's Global Summit Series *Publisher to Library: Acquiring, Editing
& Communicating Content* at the ALA Midwinter Meeting, Philadelphia, PA

7.3 Other talks

I have given colloquia at University of Hawaii, Rutgers, Penn State, Dartmouth, Haverford College, University of Washington, University of Maryland, Yale University, University of Massachusetts, SUNY, Buffalo, SUNY, Stony Brook, SUNY, Graduate center, Brown University, University of Bern, Stanford University, Ohio State University, Purdue University, Lehigh University, MIT-Harvard-Brandeis, Northeastern U, University of Chicago, I.H.E.S. in Bures sur Yvette, Fields Institute in Toronto, Columbia University, University of Miami, Notre Dame, Wesleyan, CalTech, Princeton, U of Arizona, UIUC, Dartmouth College, Rutgers U. I have also given numerous seminar talks.

8 Peer Reviewed Publications

8.1 Journal Articles

[1] Charles L. Epstein, *Research announcement of Spectral theory of geometrically periodic hyperbolic three manifolds*, C. R. Acad. Sc. Paris Serie I 300(1985), pages 431–434.

[2] —— , James Lee Hafner and Peter Sarnak, *Zeros of L-functions attached to Maass forms*, Math. Zeit., 190(1985), pages 113–128.

[3] Charles L. Epstein, *Incoming and outgoing waves*, J. of Diff. Eq., 60(1985), pages 337–362.

[4] ——, *Orthogonally integrable line fields*, Comm. in Pure and Applied Math., 1985(38), pages 599-608.

[5] ——, *Visibility of the Martin Boundary for quasiconformal metrics on D_1*, Contemporary Mathematics, 1986(51), pages 45–50.

[6] ——, *The hyperbolic Gauss map and quasiconformal reflections*, J. reine angew. Math., 1986(372), pages 96–135.

[7] ——, *The asymptotic boundary of a surface imbedded in $\mathbb{H}^3$*, Michigan Math. J., 1987(34), pages 227–239.

[8] —— and M. I. Weinstein, *A stable manifold theorem for the curve shortening equation*, Comm. Pure and Applied Math., 1987(40), pages 119–139.

[9] Charles L. Epstein, *Univalence criteria and surfaces in hyperbolic space*, J. reine angew. Math., 1987(380), pages 196–214.

[10] ——, *Asymptotics for closed geodesics in a homology class, the finite volume case*, Duke Math. J., 1987(55), pages 717–757.

[11] —— and D. M. Burns Jr. , *A global invariant for three dimensional CR–manifolds*, Invent. math., 1988(92), pages 333 –348.

[12] Charles L. Epstein, *Positive harmonic functions on Abelian covers*, J. of Funct. Anal., 1989(82), pages 303–315.

[13] —— and D. M. Burns Jr. , *Characteristic numbers of bounded domains*, Acta Math., 1990(164), pages 29–71.

[14] Charles L. Epstein, Troels Jorgensen and Curt McMullen, *Multiple intersections on negatively curved surfaces*, J. Diff Geo., 33(1991), pages 253–261.

[15] Charles L. Epstein, R. B. Melrose and Gerardo Mendoza, *Resolvent of the Laplacian on strictly pseudoconvex domains*, Acta Math. , 167(1991), pages 1–106.

[16] Charles L. Epstein and D. M. Burns, Jr., *Embeddability for three dimensional CR–manifolds*, Jour. of A. M. S., 3(1991), pages 809-841.

[17] Charles L. Epstein, *Some explicit trace formulæ* , Advanced Studies in Pure Mathematics, Zeta Functions in Geometry, 21(1992), pages 127–140.

[18] ——, *CR–structures on three dimensional circle bundles*, Inv. Math. 1992(109), pages 351-403.

[19] —— and Bruce Kleiner, *Spherical means in annular regions*, Comm. Pure and Applied Math., 44 (1993), pages 441-451.

[20] Charles L. Epstein and John Bland, *Embeddable CR–structures and Deformations of Pseudoconvex Surfaces, part 1: Formal Deformations*, Jour. of Alg. Geo., 5(1996), pages 277–368.

[21] Charles L. Epstein and John Bland, *Embeddable CR–structures and Deformations of Pseudoconvex Surfaces*, AMS/IP Studies in Advanced Mathematics, 5(1997), pages 1–27.

[22] Charles L. Epstein, *A relative index for embeddable CR-structures, I*, Annals of Math., 147(1998), pages 1–59. *Erratum: A relative index for embeddable CR-structures, I*, Annals of Math., 154(2001), 223-226.

[23] ——, *A relative index for embeddable CR–structures, II*, Annals of Math., 147(1998), pages 61–91.

[24] ——, *Appendix A to "Divisor of the Selberg Zeta Function for Kleinian Groups, I. Even Dimensions" by S.J. Patterson and Peter A. Perry*, Duke Journal, 106 (2001), pages 370–379.

[25] ——, *Deformations of singularities, complex manifolds and CR–structures*, in Advanced Studies in Pure Mathematics, CR–Geometry and Overdetermined Systems., Math. Soc. of Japan, 25(1997), pages 85–109.

[26] —— and Gennadi Henkin, *Extension of CR–structures for three–dimensional pseudoconcave manifolds*, Contemporary Mathematics, 205(1997), pages 51–67.

[27] Charles L. Epstein and Gennadi Henkin, *Stability of embeddings for pseudoconcave surfaces and their boundaries*, Acta Math., 185(2000), pages 161-237.

[28] Charles L. Epstein and R.B. Melrose, *Contact degree and the Index of Fourier Integral Operators*, MRL, 5(1998), pages 363–381.

[29] Charles L. Epstein and G. Henkin, *Two Lemmas in Local Analytic Geometry*, Contemporary Mathematics, 251(2000), pages 189–195.

[30] Charles L. Epstein and G. Henkin, *Embeddings for 3-dimensional CR-manifolds*, Progress in Mathematics, 188(2000) Birkhäuser Verlag, pages 223–236.

[31] Charles L. Epstein and Yong Ouyang, *Deformations of open Stein manifolds*, Comm. in PDE, 25(2000), pages 2333–2351.

[32] Charles L. Epstein and Gennadi Henkin, *Can a good manifold come to a bad end?*, Proceedings of Steklov Institute, 235(2001), pages 64–86.

[33] Charles L. Epstein, *Geometric bounds on the relative index*, JIMJ, 1(2002), pages 441-465.

[34] ——, *Minimum energy pulse synthesis via the inverse scattering transform*, Jour. Magn. Reson., 167(2003), pages 185-210

[35] ——, *Introduction to Magnetic Resonance Imaging for Mathematicians*, Ann. Inst. Four., 54(2004), 1697-1716.

[36] ——, *Magnetic Resonance Imaging in Inhomogeneous Fields*, Inverse Problems, 20(2004), 753-780.

[37] ——, *Convergence of the Neumann series in higher norms*, Comm. in PDE, 29(2004), 1429-1436.

[38] ——, *How well does the finite Fourier transform approximate the Fourier transform?*, Comm. Pure and App. Math., 58(2005), 1421-1435.

[39] ——, *Subelliptic Spin$_{\mathbb{C}}$ Dirac operators, I*, Annals of Math, 166(2007), 225-256.

[40] ——, *Subelliptic Spin$_{\mathbb{C}}$ Dirac operators, II*, Annals of Math 166(2007), 723-777.

[41] ——, *Subelliptic Spin$_{\mathbb{C}}$ Dirac operators, III: The Atiyah-Weinstein conjecture*, Annals of Math, 168(2008), 299-365.

[42] Jeremy Magland and Charles L. Epstein, *Exact half pulse synthesis via the Inverse Scattering Transform*, Jour. Magn. Reson., 171/2(2004), 305-313.

[43] Jeremy Magland and Charles L. Epstein, *Practical pulse synthesis via the Discrete Inverse Scattering Transform*, Jour. Magn. Reson., 172(2005), 63–78.

[44] —— and Jeremy Magland, *A novel technique for imaging with inhomogeneous fields*, Jour. Magn. Reson., 183(2006), 195-204.

[45] Charles L. Epstein, *Anderson Localization, Non-linearity and Stable Genetic Diversity*, Jour. Stat. Phys., 124(2006), 25-46.

[46] —— and John Schotland, *The Bad Truth about Laplace's Transform*, SIAM Review, 50(2008), 504-520.

[47] Charles L. Epstein, *What is a Bad End?*, The Notices of the AMS, 53(2006), 1028-1029.

[48] ——, *Subelliptic boundary conditions for Spin$_{\mathbb{C}}$-Dirac operators, gluing, relative indices and tame Fredholm pairs*, Proc. of Nat. Acad. Sci. of the USA, 103(2006), 15364-15369.

[49] Tim A.J. Hopper, Branimir Vasilic, James M. Pope, Catherine E. Jones, Charles L. Epstein, Hee Kwon Song, Felix W. Wehrli, *Experimental and computational analyses of the effects of slice distortion from a metallic sphere in an MRI phantom*. Magnetic Resonance Imaging 24 (2006) 1077–1085.

[50] Brian B. Avants, H. Hurt, J. Giannetta, C.L. Epstein, D. Shera, H. Rao, J. Wang, J., and J.C. Gee. *Effects of heavy in utero cocaine exposure on adolescent caudate morphology*. Pediatr Neurol. 37, 4 (Oct. 2007), 275-279.

[51] Brian B. Avants, C. L. Epstein, M. Grossman, and J. C. Gee, *Symmetric Diffeomorphic Image Registration with Cross-Correlation: Evaluating Automated Labeling of Elderly and Neurodegenerative Brain*, Med Image Anal. 12, 1 (2008), 26-41.

[52] Charles L. Epstein, *Cobordism, Relative Indices, and Stein Fillings*, Jour. of Geo. Anal., 18(2008), pages 341-368. doi 10.1007/s12220-008-9010-6.

[53] Langham M.C., Magland J.F., Epstein C.L., Floyd T.F., Wehrli F.W., *Accuracy and precision of MR blood oximetry based on the long paramagnetic cylinder approximation of large vessels*. Magn. Reson. Med., 62 (2009),333–340.

[54] Charles L. Epstein, *The Spectrum and Pseudospectrum of Non-Self Adjoint Pseudodifferential Operators*, Pure and Applied Math. Quarterly, 6 (2010), 815–827.

[55] Charles L. Epstein and Leslie Greengard, *Debye Sources and the Numerical Solution of the Time Harmonic Maxwell Equations*, Comm. Pure and App. Math., 63 (2010) 0413-0463.

[56] Charles L. Epstein and Jeremy F. Magland, *The Hard Pulse Approximation for the AKNS 2×2-system*, doi:10.1088/0266-5611/25/10/105006. Inverse Problems 25 (2009) 105006, 20 pp.

[57] Charles L. Epstein and Rafe Mazzeo, *Wright-Fisher Diffusion in One Dimension*, SIAM J. Math. Anal., 42 (2010), 2009, 568-608.

[58] Charles L. Epstein and Leslie Greengard, *Solving the Poisson Equation on a Surface by Reduction to a 1-dimensional Problem*, Comm. in Math. Analysis, 8(2010), 26–40.

[59] Ricky Der, Charles L. Epstein and Joshua B. Plotkin, *Generalised Population Models and the Nature of Genetic Drift*, Theor. Pop. Biol.; 2011, doi:10.1016/j.tpb.2011.06.004, 20 pp.

[60] Charles L. Epstein, Leslie Greengard, and Michael O'Neil, *Debye Sources and the Numerical Solution of the Time Harmonic Maxwell Equations, II*, Comm. Pure and App. Math., doi: 10.1002/cpa.21420, 2012, 37pp.

[61] C. Li, M.C. Langham, C.L. Epstein, J.F. Magland, J. Wu, J. Gee, F.W. Wehrli, *Accuracy of the cylinder approximation for susceptometric measurement of intravascular oxygen saturation*. Magn Reson Med. 67(3)(2012):808-13. doi: 10.1002/mrm.23034.

[62] C.L. Epstein, L. Greengard, Z. Gimbutas, A. Klöckner, and M. O'Neil, *A consistency condition for the vector potential in multiply-connected domains*, IEEE Trans. on Magnetics, 49 (2013), 1072–1075.

[63] Ricky Der, Charles L. Epstein and Joshua Plotkin, *Population genetics when the distribution offspring number is skewed*, Genetics, 191 (2012), 1331-1344.

[64] C.L. Epstein, *Addendum to: Subelliptic Spin$_\mathbb{C}$ Dirac Operators, III*, Annals of Math., 176(2012), 1373–1380.

[65] C.L. Epstein, L. Greengard, and A. Klöckner, *On the convergence of local expansions of layer potentials*, SIAM J. Numer. Anal. 51-5 (2013), pp. 2660-2679. http://dx.doi.org/10.1137/120902859.

[66] C.L. Epstein and Camelia Pop, *Regularity for the Supercritical Fractional Laplacian with Drift*, preprint, 2013, 16pp.

[67] C.L. Epstein and R. Mazzeo, C^0-*estimates for Degenerate Diffusion Operators Arising in Population Biology*, preprint, 2013, 50pp.

[68] Charles L. Epstein, Leslie Greengard, and Michael O'Neil, *Debye Sources, Beltrami Fields and a Complex Structure on Maxwell Fields*, preprint, 2013, 45pp.

[69] David M. McCandlish, Charles L. Epstein, and Joshua B. Plotkin, *The inevitability of unconditionally deleterious fixations during adaptation*, accepted for publication in Evolution, 2013.

8.2   Refereed Books

[1] Charles L. Epstein, **The Spectral Theory of Geometrically Periodic Hyperbolic 3–manifolds**, Memoirs of the American Mathematical Society, no. 335 58(1985), 161 pages.

[2] Charles L. Epstein, **Introduction to the Mathematics of Medical Imaging**, Prentice Hall, Saddle River, NJ, 2003, xxix+739 pages.

[3] Charles L. Epstein, **Introduction to the Mathematics of Medical Imaging, 2nd Ed.**, SIAM, Philadelphia, PA, 2008, xxxiii+761 pages.

[4] Charles L. Epstein and Rafe Mazzeo, **Degenerate Diffusion Operators Arising in Population Biology**, Annals of Math. Studies, No. 185, Princeton Press, Princeton, NJ, 2013, 320 pages.

8.3   Refereed Book Chapters

[1] Charles L. Epstein and Michael Gage, *The curve shortening flow*, in **Wave Motion, Theory and Modeling**, Math. Sci. Research Inst. Publications, 1987 pp. 15–59.

[2] Charles L. Epstein, *Lectures on indices and relative indices on contact and CR-manifolds*, in **Woods Hole Mathematics**, edited by Nils Tongring and R.C. Penner, World Scientific Pub., Singapore, 2004, pp 27–93.

[3] Charles L. Epstein and Felix W. Wehrli, *Magnetic Resonance Imaging*, in **Encyclopedia of Mathematical Physics**, 367–375, Elesevier, 2006.

[4] Charles L. Epstein, *Pseudodifferential Methods for Boundary Value Problems*, in **Pseudo-Differential Operators:Partial Differential Equations and Time-Frequency Analysis**, Luigi Rodino, Bert-Wolfgang Schulze, and M. W. Wong, editors. Fields Institute Communications, volume 52. AMS, Providence, RI. 414pp., 2007.

[5] Charles L. Epstein, *Magnetic Resonance Imaging*, to appear in **Encyclopedia of Applied and Computational Mathematics**, Editor-in-Chief: Björn Engquist, Springer Verlag, to appear 2014.

[6] Charles L. Epstein and Jeremy F. Magland, *Inverse Scattering Pulse Design* in **Encyclopedia of Magnetic Resonance, 2nd Ed.**, eds R. K. Harris and R. E. Wasylishen, John Wiley: Chichester. DOI: 10.1002/9780470034590.emrstm1303. Published 15th June 2012.

[7] Charles L. Epstein and Rafe Mazzeo, *Analysis of Degenerate Diffusion Operators Arising in Population Biology*, in **From Fourier Analysis and Number Theory to Radon Transforms and Geometry**, H. Farkas editor, Springer-Verlag, 2012, 203–216.

[8] C.L. Epstein and R. Mazzeo, *The geometric microlocal analysis of generalized Kimura and Heston diffusions*, submitted to Proc. of Workshop on non-linear PDE conference, Jaoa Pessoa, Brazil 2012, 29pp.

[9] Charles L Epstein, *Medical Imaging*, in **The Princeton Companion to Applied Mathematics**, Nicholas Higham, editor, Princeton Press, Princeton NJ, 2013, 8pp.

8.4   Refereed Meeting Abstracts

[1] Jeremy Magland and Charles L. Epstein, *Equiripple RF-pulse pulse design using Inverse Scattering Theory*, Proceedings of the ISMRM annual meeting, 2005.

[2] B. B. Avants, C.L. Epstein, and J.C. Gee, *Geodesic image interpolation: Parameterizing and interpolating spatiotemporal images*. In Variational, Geometric, and Level Set Methods in Computer Vision (2005), vol. 3752 of Lecture Notes In Computer Science, Springer Berlin / Heidelberg, pp. 247-258.

[3] Charles L. Epstein and Jeremy Magland, *Slant slice imaging in in inhomogeneous fields*, Proceedings of the ISMRM annual meeting, 2006.

[4] B. B. Avants, H. Hurt, J. Giannetta, C.L. Epstein, D. Shera, J. Wang, and J. C. Gee, *Analyzing effects of intra-uterine cocaine exposure on adolescent brain structure with symmetric diffeomorphisms*. In IEEE Comp. Soc. Conf. on Computer Vision and Pattern Recognition (2006), H. Hurt, Ed., pp. 94-94.

[5] B. B. Avants, C.L. Epstein, and J.C. Gee *Geodesic image normalization and temporal parameterization in the space of diffeomorphisms*. In Medical Imaging and Augmented Reality (2006), vol. 4091 of Lecture Notes in Computer Science, Springer Berlin / Heidelberg, pp. 9-16.

[6] Brian B. Avants and C. L. Epstein and J. C. Gee, *Geodesic Image Normalization in the Space of Diffeomorphisms*, 1st MICCAI Workshop on Mathematical Foundations of Computational Anatomy: Geometrical, Statistical and Registration Methods for Modeling Biological Shape Variability (2006) 125-135.

[7] Charles L. Epstein and Jeremy F. Magland, *A Simple Method for Measuring and Removing Susceptibility Artifacts*, ISMRM annual meeting, Berlin, Germany, May 2007.

[8] B. B. Avants, C.L. Epstein, and J.C. Gee *Symmetric shape averaging in the diffeomorphic space*. In IEEE Intl. Symp. on Biomed. Imaging: Macro to Nano (2007), pp. 636-639.

[9] Charles L. Epstein, *Models and equations for RF pulse design*, ISMRM annual meeting, Toronto, Canada, May, 2008.

[10] Michael C. Langham, Jeremy F. Magland, and Charles L. Epstein, *Accuracy and precision of MR blood oximetry based on the long paramagnetic cylinder approximation of large vessels*. Proceedings of the ISMRM annual meeting, Honolulu, HI. 2009, p 1925.

8.5   Unpublished Papers

[1] Charles L. Epstein *Envelopes of Horospheres and Weingarten Surfaces in Hyperbolic 3-Space*, preprint, 63 pages, 1984. Available at:
http://www.math.upenn.edu/~cle/papers/WeingartenSurfaces.pdf.

[2] Charles L. Epstein *The Theorem of A. Schur in Hyperbolic Space*, preprint, 46 pages, 1985. Available at:
http://www.math.upenn.edu/~cle/papers/SchursLemma.pdf

[3] Charles L. Epstein and R.B. Melrose, *Shrinking Tubes and the $\bar{\partial}$-Neumann Problem*, manuscript, 300 pages, 1990. Available at:
http://www.math.upenn.edu/~cle/papers/stdbnp.pdf

[4] Charles L. Epstein and R.B. Melrose, *The Heisenberg Algebra, Index Theory and Homology*, manuscript, 250 pages, 2003.

[5] Charles L. Epstein, *Bandwidth and Bad Driving*, Available at:
http://www.math.upenn.edu/~cle/papers/bandwidth.pdf

[6] Charles L. Epstein and Jack Morava, *Tempering the Polylogarithm*, available at:
arXiv.org:math.CA/0611240, 12 pages, 2010.

9   Patents

[1] Charles L. Epstein and Jeremy Magland, *Practical Pulse Synthesis via the Inverse Scattering Transform*, US patent 7,038,452, May 2, 2006.

[2] Charles L. Epstein and Jeremy Magland, *Exact half pulse synthesis via the Inverse Scattering Transform*, US patent 7,166,998, January 23, 2007.

[3] Charles L. Epstein and Jeremy Magland, *Methods and Apparatus for Magnetic Resonance Imaging in Inhomogeneous Fields*, US patent 7,309,986, December 18, 2007.

[4] Charles L. Epstein and Jeremy Magland, *Practical Pulse Synthesis via the Discrete Inverse Scattering Transform*, US Patent 7,436,175, October 14, 2008.