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CURRICULUM VITAE

1. Norbert Joseph Pelc
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2. Personal:

Born January 7, 1953, Buenos Aires, Argentina
Naturalized U.S. Citizen (1974)
Married (Lorie Rae Pelc)
2 children
3. Education:

1974 B.S., Applied Mathematics, Engineering and Physics
 University of Wisconsin

1976 S.M., Medical Radiological Physics
 Harvard University

1979 Sc.D., Medical Radiological Physics
 Harvard University
 Dissertation: "A Generalized Filtered Backprojection
 Algorithm for Three Dimensional Reconstruction"
4. Publications and patents: see attached list
5. Employment and appointments:

12/02-present Associate Chair for Research
 Department of Radiology
 Stanford University School of Medicine

5/97-present Professor
 Department of Radiology
 Stanford University School of Medicine

5/97-present Professor - courtesy
 Department of Electrical Engineering
 Stanford University

1/90-5/97 Associate Professor
 Department of Radiology
 Stanford University School of Medicine

1/90-5/97 Associate Professor - courtesy
 Department of Electrical Engineering
 Stanford University

12/82-1/90 Senior Physicist - Applied Science Laboratory
 General Electric Medical Systems

8/82-1/90 Assistant Clinical Professor - Department of Radiology
 Medical College of Wisconsin

1/88-6/88 Visiting Professor - Department of Biomedical Engineering
Duke University

2/81-12/82 Manager - Applied Science Laboratory
General Electric Medical Systems

10/78-2/81 Senior Physicist - Applied Science Laboratory
General Electric Medical Systems

9/74-10/78 Research Assistant - Physics Research Laboratory
Massachusetts General Hospital

1/73-6/74 Part-time Research Assistant - Bone Mineral Laboratory
University of Wisconsin

6. Fellowships:

1/88-4/88 GE Medical Systems Research Fellowship
Duke University Medical Center, Department of Radiology

9/77-10/78 NIH Traineeship in Medical Radiological Physics
Harvard University, School of Public Health

9/74-9/77 NSF Graduate Fellow
Harvard University, School of Public Health

6/72-9/72 NSF Undergraduate Research Fellow
University of Wisconsin, Department of Mathematics

7. Teaching:

1993-present Doctoral Research Advisor
Dept of Electrical Engineering, Stanford University
Biophysics Program, Stanford University

1991-present Current Concepts in Magnetic Resonance
sponsored by Stanford University
Course director 1993-1996

1990-present Resident's physics course
Dept of Radiology, Stanford University

1987-present Advanced Techniques in MRI
sponsored by Duke University

1989-1990 member - Steering Committee
Biophysics Graduate Program, Medical College of Wisconsin

1982-1990 Doctoral Research Advisor
Biophysics Graduate Program, Medical College of Wisconsin

1978 Physics of Diagnostic Radiology
New England Chapter - Roentgen Ray Society

1976-1978 Principles of Computerized Tomography
Massachusetts Institute of Technology (22.85s)

1976 Bionucleonics Laboratory
Massachusetts College of Pharmacy

1976 Undergraduate Physics Laboratory
Massachusetts College of Pharmacy

8. Honors:

Fellow of the Society of Magnetic Resonance Imaging
Fellow of the Council on Cardiovascular Radiology, American Heart Association
ISMRM Young Investigator Finalist : (Madore, 1999), (Markl, 2003)
RSNA Research Fellow Award (Fahrig, 2001), (Reeder, 2002), (Markl, 2002)
ARRS President's Award: (Reeder, 2001)
Cum Laude Citation (scientific exhibit), RSNA, 1997
Moncada Award, Soc. Body Comput. Tomogr., 1992
Cum Laude Award, Soc. Body Comput. Tomogr., 1990, 1992, 2001
Editor's Recognition Award, Radiology, 1991-1994
Winthrop Award, Soc. Body Comput. Tomogr., 1991
Magna Cum Laude Award, Soc. Body Comput. Tomogr., 1991
Lauterbur Award, Soc. Body Comput. Tomogr., 1990
Phi Beta Kappa (1974)
Senior Honors (University of Wisconsin - 1974)
Sophomore Honors (University of Wisconsin - 1972)
Phi Eta Sigma (1972)

9. Memberships and National Committees:

International Society of Magnetic Resonance in Medicine (ISMRM) (1988-present)
Board of Trustees (1999-present)
SMRI Annual Meeting and Educational Coordination Council (1993-1994)
SMRI 1994 Annual Meeting Scientific Program Co-chairman
Annual Meeting Scientific Program Committee - 1994-1997
Chairman - Study Group on MR Flow and Motion Quantitation (1998-1999)
Steering Committee - Study Group on MR Flow and Motion Quantitation
American Association of Physicists in Medicine (AAPM) (1976-present)
AAPM Task Group on Bone Mineral Measurement (1985-1990)
American Heart Association (AHA) (1993-present)
AHA Council on Cardiovascular Radiology (1993-present)
AHA Committee on New Imaging Modalities (1993-present)
American Association for the Advancement of Science (AAAS) (1996-present)

10. Review activity:

Journals:

JMIRI, Radiology, Medical Physics, Mag. Res. Med., Rev Sci. Instrum.
Nuclear Medicine Communications

Abstracts to annual meetings:

AAPM, RSNA, ISMRM

Funding agencies:

National Institutes of Health
Radiology and Nuclear Medicine Study Section, 1993-1997
NHLBI Board of Scientific Counselors (ad hoc member, 1999)
NIBIB National Advisory Council (2003-present)
Medical Research Council of Canada
Veterans Administration
Whitaker Foundation
Scientific Advisory Committee Member (1999-present)

11. Editorial Boards:

Medical Physics

PUBLICATIONS - Norbert J. Pelc

Papers or chapters in books and journals:

1. G. Cornell, N.J. Pelc, and M.L. Wage: Simple groups of orders less than 1000. *J. Undergrad. Math.*, 5, 2, 1973.
2. D.A. Chesler, S. Aronow, J.E. Correll, S.J. Riederer and N.J. Pelc: Statistical properties and simulation studies of transverse section algorithms. In Reconstruction Tomography in Diagnostic Radiology and Nuclear Medicine, M.M. Ter Pogossian et. al. eds., University Park Press, Baltimore, MD, 1977.
3. D.A. Chesler, S.J. Riederer, and N.J. Pelc: Noise due to photon counting statistics in computed x-ray tomography. *J. Comput. Assist. Tomog.*, 1, 1, 64, 1977.
4. S.J. Riederer, N.J. Pelc, and D.A. Chesler: The noise power spectrum in computed x-ray tomography. *Phys. Med. Biol.*, 23, 3, 446, 1978.
5. N.J. Pelc and D.A. Chesler: Utilization of cross-plane rays for three-dimensional reconstruction by filtered backprojection. *J. Comput. Assist. Tomog.*, 3, 3, 385, 1979.
6. G.H. Glover and N.J. Pelc: Non-linear partial volume artifacts in x-ray computed tomography. *Med. Phys.*, 7, 3, 1980.
7. L.A. Lehmann, W.R. Brody, A. Macovski, B. Struhl, F.A. DiBianca and N.J. Pelc: Source limitations in scanned projection radiography. *Proc. SPIE*, 233, 43-48, 1980.
8. S.J. Riederer, N.J. Pelc, J-P.J. Georges, G.S. Keyes, L.A. Lehmann, and A.H. Hall: Beam hardening, noise, and contrast considerations in selective iodine digital radiography. *IEEE Trans. Nuc. Sci.*, 1981.
9. L.A. Lehmann, R.E. Alvarez, A. Macovski, N.J. Pelc, S.J. Riederer, A.L. Hall, and W.R. Brody: Generalized image combinations in dual kVp digital radiography. *Med. Phys.*, 8, 5, 1981.
10. S.J. Riederer, F.A. DiBianca, J-P.J. Georges, G.A. Jensen, G.S. Keyes, N.J. Pelc, E.R. Steinike, and W.H. Wesbey: Performance characteristics of a digital fluorographic system. *Proc. SPIE*, 273, 88-95, 1981.
11. J-P.J. Georges, G.S. Keyes, N.J. Pelc, and S.J. Riederer: An understanding of digital radiography through image computer simulation. *Proc. SPIE*, 273, 96-102, 1981.
12. W.R. Brody, D.R. Enzmann, L-S Deutsch, A.L. Hall, and N.J. Pelc: Intravenous carotid arteriography using line-scanned digital radiography. *Radiology*, 139, 297-300, 1981.
13. W.R. Brody, A. Macovski, N.J. Pelc, L.A. Lehmann, R.A. Joseph, and L.S. Edelheit: Intravenous arteriography using scanned projection radiography. *Radiology*, 141, 509-514, 1981.
14. F.G. Sommer, W.R. Brody, D. Gross, A. Macovski, A.L. Hall, and N.J. Pelc: Excretory urography using dual-energy scanned projection radiography. *Radiology*, 141, 529-532, 1981.
15. W.R. Brody, D.M. Cassel, F.G. Sommer, L.A. Lehmann, A. Macovski, R.E. Alvarez, N.J. Pelc, S.J. Riederer, and A.L. Hall: Dual energy projection radiography: initial clinical experience. *AJR* 137, 201-205, 1981.
16. A.L. Hall, N.J. Pelc, S.J. Riederer, G.S. Keyes, W.R. Brody, L.A. Lehmann, A. Macovski, and R.E. Alvarez: Experimental system for dual energy scanned projection radiography. *Proc. SPIE*, 314, 1981.
17. S.W. Flax, G.H. Glover, and N.J. Pelc: Textural variations in B-mode ultrasonography: a stochastic model. *Ultrasonic Imag.*, 3, 235-257, 1981.
18. G.H. Glover and N.J. Pelc: An algorithm for the reduction of metal clip artifacts in CT reconstructions. *Med. Phys.*, 8, 6, 1981.
19. S.J. Riederer, B.F. Belanger, G.S. Keyes and N.J. Pelc: Iodine sensitivity of digital imaging systems. *Proc. SPIE*, 314, 1981.
20. W.R. Brody, D.R. Enzmann, D.C. Miller, D.F. Guthaner, N.J. Pelc, G.S. Keyes and S.J. Riederer: Intravenous arteriography using digital subtraction techniques. *JAMA*, 248, 671-674, 1982.

21. D.R. Enzmann, W.R. Brody, S. Riederer, G. Keyes, W. Collins and N. Pelc: Intracranial intravenous digital subtraction angiography. *Neuroradiology*, 23, 241-251, 1982.
22. S.J. Riederer, D.R. Enzmann, A.L. Hall, N.J. Pelc, and W.T. Djang: The application of matched filtering to x-ray exposure reduction in digital subtraction angiography: clinical results. *Radiology*, 146, 349-354, 1983.
23. S.W. Flax, G.H. Glover, N.J. Pelc, F.D. Gutmann and M. McLachlan: Spectral variations in tissues and phantoms. *Ultrasound Med Biol*, 2, 127-131, 1983.
24. D.R. Enzmann, W.R. Brody, W.T. Djang, S. Riederer, G. Keyes, W. Collins and N. Pelc: Intraarterial digital subtraction spinal angiography. *AJNR*, 4, 25-26, 1983.
25. S.W. Flax, N.J. Pelc, G.H. Glover, F.D. Gutmann and M. McLachlan: Spectral characterization and attenuation measurements in ultrasound. *Ultrason Imaging*, 5, 95-116, 1983.
26. S.J. Riederer, A.L. Hall, J.K. Maier, N.J. Pelc, and D.R. Enzmann: The technical characteristics of matched filtering in digital subtraction angiography. *Med Phys*, 10, 209-217, 1983.
27. N.J. Pelc: Statistical aspects of digital x-ray imaging. In Electronic Imaging in Medicine, G.D. Fullerton, *et.al.* eds., AAPM Monograph 11, Am. Inst. Phys., New York, 1984.
28. G.T. Gullberg, R.H. Huesman, J.A. Malko, N.J. Pelc, and T.F. Budinger: An attenuated projector-backprojector for iterative SPECT reconstruction. *Phys. Med. Biol.*, 30, 799-816, 1985.
29. G.H. Glover, C.E. Hayes, N.J. Pelc, W.A. Edelstein, O.M. Mueller, H.R. Hart, C.J. Hardy, M. O'Donnell, and W.D. Barber: Comparison of linear and circular polarization for magnetic resonance imaging. *J. Mag. Res.*, 64, 2, 1985.
30. L. Axel, G.H. Glover, and N.J. Pelc: Chemical shift magnetic resonance imaging of two-line spectra by gradient reversal. *Mag. Res. Med.*, 2, 428-436, 1985.
31. J.A. Utz, R.J. Herfkens, C.D. Johnson, A. Shimakawa, N.J. Pelc, G.H. Glover, G.A. Johnson and C.E. Spritzer: Two-second MR images: Comparison with spin-echo images in 29 patients. *AJR*, 148, 629-633, 1987.
32. J.A. Utz, R.J. Herfkens, J.A. Heinsimer, T. Bashore, R. Califf, G. Glover, N. Pelc and A. Shimakawa: Cine MR determination of left ventricular ejection fraction. *AJR*, 148, 839-43, 1987.
33. E.K. Fram, R.J. Herfkens, G.A. Johnson, G.H. Glover, J.P. Karis, A. Shimakawa, T.G. Perkins and N.J. Pelc: Rapid calculation of T1 using variable flip angle gradient refocused imaging. *Magn Reson Imaging*, 5, 201-8, 1987.
34. N.J. Pelc and J.G. Colsher: Principles of x-ray computed tomography. In Radiology, J.M. Taveras and J.T. Ferrucci, eds., chpt. 30, J. B. Lippincott Co., Philadelphia, 1987.
35. J.G. Colsher and N.J. Pelc: Computed tomography systems and performance. In Radiology, J.M. Taveras and J.T. Ferrucci, eds., chpt. 31, J. B. Lippincott Co., Philadelphia, 1987.
36. C.R. Crawford, J.G. Colsher and N.J. Pelc: High speed reprojection and its applications. *Proc. SPIE*, 914, 311, 1988.
37. G.H. Glover and N.J. Pelc: A rapid gated cine MRI technique. In Magnetic Resonance Annual 1988, H.Y. Kressel ed., pp. 299-333, Raven Press, New York, 1988.
38. J.R. MacFall, N.J. Pelc, and R. Vavrek: Correction for spatially dependent phase shifts for partial Fourier imaging. *Mag. Res. Imag.*, 6, 143-155, 1988.
39. J.A. Utz, R.J. Herfkens, J.A. Heinsimer, A. Shimakawa, G.H. Glover and N.J. Pelc: Valvular regurgitation: dynamic MR imaging. *Radiology*, 168, 91-94, 1988.
40. J.N. Lee, S.J. Riederer, and N.J. Pelc: Flow compensated limited flip angle MR angiography. *Mag. Res. Med.*, 12, 1-13, 1989.
41. F. Farzaneh, S.J. Riederer, and N.J. Pelc: Analysis of T2 limitations and off-resonance effects on spatial resolution and artifacts in echo-planar imaging. *Mag. Res. Med.*, 14, 123-39, 1990.
42. P. Schmalbrock, C. Yuan, D.W. Charkeres, J. Kohli, and N.J. Pelc: Methods to achieve very short echo times for volume magnetic resonance angiography. *Radiology*, 175, pp. 861-865, 1990.
43. C.E. Spritzer, N.J. Pelc, J.N. Lee, A.J. Evans, H.D. Sostman and S.J. Riederer: Preliminary experience with rapid MR blood flow imaging using a phase sensitive limited flip angle gradient refocussed pulse sequence. *Radiology*, 176, 255-262, 1990.

44. D.E. Enzmann and N.J. Pelc: Normal flow patterns of intracranial and spinal cerebrospinal fluid defined by phase-contrast cine MR imaging. *Radiology*, 178, pp 467-474, 1991
45. H. Munechika, D.C. Sullivan, L.W. Hedlund, C.A. Beam, H.D. Sostman, R.J. Herfkens, and N.J. Pelc: Evaluation of acute renal failure with magnetic resonance imaging using gradient-echo and Gd-DTPA. *Invest Radiol*, 26, 22, 1991.
46. J.S. Tsuruda, A. Shimakawa, N.J. Pelc, and D. Saloner: Dural sinus occlusion: evaluation with phase sensitive gradient echo MR imaging. *AJNR*, 12, 481-488, 1991.
47. C.L. Dumoulin, S.P. Souza, R.D. Darrow, N.J. Pelc, W.J. Adams and S.A. Ash: Simultaneous acquisition of phase-contrast angiograms and stationary-tissue images with Hadamard encoding of flow-induced phase shifts. *JMRI*, 1, 399-404, 1991.
48. N.J. Pelc, M.A. Bernstein, A. Shimakawa, and G.H. Glover: Encoding strategies for three direction phase contrast MRI. *JMRI*, 1, 405-413, 1991.
49. N.J. Pelc, R.J. Herfkens, A. Shimakawa and D.R. Enzmann: Phase contrast cine magnetic resonance imaging. *Mag Res Quarterly*, 7, 229-254, 1991.
50. M.P. Marks, N.J. Pelc, M.R. Ross, and D.R. Enzmann: Determination of cerebral blood flow with a phase-contrast cine MR imaging technique: Evaluation of normal subjects and patients with arteriovenous malformations. *Radiology*, 182, 467-476, 1992.
51. F.G. Sommer, B. Noorbehesht, N.J. Pelc, R. Jamison, A. Pinevich, L. Newton, and B. Myers: Renal blood flow measurement using phase-contrast cine MRI: Preliminary report. *Invest. Radiol*, 27, 465-470, 1992.
52. M.A. Bernstein, A. Shimakawa, and N.J. Pelc: Minimizing TE in moment-nulled or flow encoded Two- and Three- dimensional gradient-echo imaging. *JMRI*, 2, 583-588, 1992.
53. D.R. Enzmann and N.J. Pelc: Brain motion: measurement with phase-contrast MR Imaging. *Radiology*, 185, 653-660, 1992.
54. L.R. Pelc, N.J. Pelc, S.C. Rayhill, L.J. Castro, G.H. Glover, R.J. Herfkens, D.C. Miller, and R.B. Jeffrey: Arterial and venous blood flow: noninvasive quantitation with MR imaging. *Radiology*, 185, 809-812, 1992.
55. C.L. Dumoulin, S.P. Souza and N.J. Pelc: Phase sensitive flow imaging. In *Magnetic Resonance Angiography: Concepts and Applications*, E.J. Potchen, J.E. Siebert, E.M. Haacke, and A. Gottschalk, Eds., Mosby, St. Louis, pp 173-186, 1993.
56. A.J. Evans, F. Iwai, T.A. Grist, H.D. Sostman, L.A. Hedlund, C.E. Spritzer, R. Negro-Vilar, C.A. Beam and N.J. Pelc: MR imaging of blood flow with a phase subtraction technique: *In-vitro* and *in-vivo* validation. *Invest. Radiol*. 28, 109-115, 1993.
57. R.N. Low, I.R. Francis, R.J. Herfkens, R.B. Jeffrey, G.M. Glazer, T.K.F. Foo, A. Shimakawa, and N.J. Pelc: Fast multiplanar spoiled gradient-recalled imaging of the liver: Pulse sequence optimization and comparison with Spin-Echo MR imaging. *AJR* 160, 501-509, 1993.
58. N.J. Pelc: Spin preparation and manipulation techniques. In *The Physics of MRI*, P. Sprawls and M.J. Bronskill, Eds., AAPM, Woodbury NY, pp. 268-287, 1993.
59. N.J. Pelc and G.H. Glover: A stroll through k-space. In *The Physics of MRI*, P. Sprawls and M.J. Bronskill, Eds., AAPM, Woodbury NY, pp. 771-784, 1993.
60. N. J. Pelc: Optimization of flip angle for T₁ dependent contrast in MRI. *Magn. Reson. Med* 29, 695-699, 1993.
61. M.R. Ross, N.J. Pelc, and D.R. Enzmann: Qualitative phase contrast MR angiography in the normal and abnormal Circle of Willis. *AJNR* 14, 19-25, 1993.
62. J.F. Debatin, J.A. Strong, H.D. Sostman, R. Negro-Vilar, J.M. Douglas, C.E. Spritzer, and N.J. Pelc: MR characterization of blood flow in native and grafted internal mammary arteries. *JMRI* 3, 443-450, 1993.
63. S.M. Song, S.A. Napel, G.H. Glover, and N.J. Pelc: Noise reduction of 3-D phase contrast MR velocity measurements. *JMRI*, 3, 587-596, 1993.
64. D.R. Enzmann, M.P. Marks, and N.J. Pelc: Comparison of cerebral artery blood flow measurements with gated cine and ungated phase-contrast techniques. *JMRI*, 3, 705-712 1993.
65. D.R. Enzmann and N.J. Pelc: Cerebrospinal fluid flow measured by phase contrast cine MR. *AJNR*, 14, 1301-1307, 1993.

66. J.M. Silverman, P.J. Julien, R.J. Herfkens and N.J. Pelc: Quantitative differential pulmonary perfusion: MR imaging versus radionuclide lung scanning. *Radiology*, 189, 699-701, 1993.
67. K.C.P. Li, W.S. Whitney, C.H. McDonnell, J.O. Fredrickson, N.J. Pelc, R.L. Dalman and R.B. Jeffrey: Chronic mesenteric ischemia: Evaluation with phase-contrast cine MR Imaging. *Radiology* 190, 175-179, 1994.
68. J.F. Debatin, R.H. Ting, H. Wegmüller, F.G. Sommer, J.O. Fredrickson, T.J. Brosnan, B.S. Bowman, B.D. Myers, R.J. Herfkens and N.J. Pelc: Renal arterial blood flow: Quantitation with phase-contrast MR imaging with and without breath-holding. *Radiology*, 190, 371-378, 1994.
69. P.M. Chappell, N.J. Pelc, T.K.F. Foo, G.H. Glover, S.P. Haros, and D.R. Enzmann. Comparison of lesion enhancement on spin-echo and gradient-echo images. *AJNR*, 15, 37-44, 1994.
70. D.R. Enzmann, M.R. Ross, M.P. Marks, and N.J. Pelc: Blood flow in major cerebral arteries measured by phase-contrast cine MR. *AJNR*, 15 123-129, 1994.
71. J.E. Jordan, N.J. Pelc, and D.R. Enzmann: Velocity and flow quantitation in the superior sagittal sinus with ungated and Cine (gated) phase contrast MR imaging. *JMRI* 4, 25-28, 1994.
72. A.M. Norbash, N.J. Pelc, A. Shimakawa and D.R. Enzmann: Shunt flow measurement and evaluation of valve oscillation with a spin-echo phase contrast MR sequence. *Radiology* 190, 560-564, 1994.
73. J.E. Drace and N.J. Pelc: Measurement of skeletal muscle motion *in-vivo* with phase contrast MR imaging. *JMRI*, 4, 157-163, 1994.
74. J.O. Fredrickson and N.J. Pelc: Time resolved MR imaging by automatic data segmentation. *JMRI*, 4, 189-196, 1994.
75. D.F. Schomer, M.P. Marks, G.K. Steinberg, I.M. Johnstone, D.B. Boothroyd, M.R. Ross, N.J. Pelc and D.R. Enzmann: The anatomy of the posterior communicating artery as a risk factor for ischemic cerebral infarction. *N Engl J Med*, 330, 1565-1570, 1994.
76. B.D. Myers, F.G. Sommer, K.C.P. Li, S. Tomlanovich, N.J. Pelc, C.H. McDonnell, E. Pagtalunan, L. Newton and R. Jamison: Determination of blood flow to the transplanted kidney: a novel application of phase-contrast cine magnetic resonance imaging. *Transplantation*, 57, 1445-1450, 1994.
77. J.E. Drace and N.J. Pelc: Elastic deformation in tendons and myotendinous tissue: Measurement by phase contrast MR imaging. *Radiology*, 191, 835-839, 1994.
78. M.A. Bernstein, M. Grgic, T.J. Brosnan, and N.J. Pelc: Reconstructions of phase contrast, phased array multicoil data. *Mag. Res. Med.*, 32, 330-334, 1994.
79. G.D. Rubin, R.J. Herfkens, N.J. Pelc, T.K.F. Foo, S.A. Napel, A. Shimakawa, R.M. Steiner and C.J. Bergin: Single breath-hold pulmonary MR angiography: optimization and comparison of three imaging strategies. *Invest. Radiol.*, 29, 766-772, 1994.
80. G.B. Pike, C.H. Meyer, T.J. Brosnan and N.J. Pelc: Magnetic resonance velocity imaging using a fast spiral phase contrast sequence. *Mag. Res. Med.* 32, 476-483, 1994.
81. N.J. Pelc, F.G. Sommer, K.C.P. Li, T.J. Brosnan, R.J. Herfkens, D.R. Enzmann: Quantitative Magnetic Resonance flow imaging. *Magn Reson Quarterly* 10, 125-147, 1994.
82. J.E. Drace and N.J. Pelc: Skeletal muscle contraction: Analysis with use of velocity distributions from phase-contrast MR imaging. *Radiology* 193, 423-429, 1994.
83. J.E. Drace and N.J. Pelc: Tracking the motion of skeletal muscle with velocity-encoded MR Imaging. *JMRI* 4, 773-778, 1994.
84. J.M. Silverman, P.J. Julien, R.J. Herfkens, and N.J. Pelc: Magnetic resonance imaging evaluation of pulmonary vascular malformations. *Chest* 106, 1333-1338, 1994.
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87. J.F. Debatin, R. Dalman, R.J. Herfkens, E.J. Harris, and N.J. Pelc: Phase contrast MRI assessment of pedal blood flow. *Eur. Radiol.* 5, 36-42, 1995.

88. J.O. Fredrickson, H. Wegmüller, R.J. Herfkens, and N.J. Pelc: Simultaneous temporal resolution of cardiac and respiratory motion. *Radiology* 195, 169-175, 1995.
89. S.M. Song, S.A. Napel, N.J. Pelc, and G.H. Glover: Phase unwrapping of MR images using Poisson equation. *IEEE Trans Image Processing* 4, 667-676, 1995.
90. N.J. Pelc, M. Drangova, L.R. Pelc, Y. Zhu, D.C. Noll, B.S. Bowman, and R.J. Herfkens: Tracking of cyclical motion using phase contrast cine MRI velocity data. *JMRI* 5, 339-345, 1995.
91. A. Lingamneni, P.A. Hardy, K.A. Powell, N.J. Pelc, and R.D. White: Validation of cine phase-contrast for motion analysis. *JMRI* 5, 331-338, 1995.
92. N.J. Pelc and T. Sumanaweera: Reply to T1 weighted signal contrast optimization by RF pulses (Letter). *Mag Res Med* 34, 134-135, 1995.
93. N.J. Pelc: Flow quantification and analysis methods. In Magnetic Resonance Imaging Clinics of North America - MR Angiography of the Central Nervous System, A.W. Litt, ed., pp. 413-424. W.B. Saunders, Philadelphia, 1995.
94. J-R Liao, F.G. Sommer, R.J. Herfkens, and N.J. Pelc: Cine spiral imaging. *Mag Res Med* 34, 490-493, 1995.
95. M. Drangova and N.J. Pelc: Artifacts and signal loss due to flow in the presence of B_0 inhomogeneity. *Mag Res Med* 35, 126-130, 1996.
96. Y. Zhu, M. Drangova and N.J. Pelc: Fourier tracking of myocardial motion using Cine-PC data. *Mag Res Med* 35, 471-480, 1996.
97. J.O Fredrickson and N.J. Pelc: Temporal resolution improvement in dynamic imaging. *Mag Res Med* 35, 621-625, 1996.
98. M. Drangova, B.S. Bowman and N.J. Pelc: Physiological motion phantom for MRI applications. *JMRI* 6, 513-8, 1996.
99. R.N. Low, J.S. Sigeti, S.Y.T. Song, A. Shimakawa and N.J. Pelc: Dynamic contrast-enhanced breath-hold MR imaging of thoracic malignancy using cardiac compensation. *JMRI* 6, 625-631, 1996.
100. M.T. Alley, J.M. Pauly, F.G. Sommer and N.J. Pelc: Angiographic imaging with 2D RF pulses. *Mag Res Med* 37, 260-267, 1997.
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103. J.F. Debatin, R. Dalman, N.J. Pelc, and E.J. Harris: Cine phase-contrast MRI assessment of pedal blood flow. JMRI, 4P, 66, 1994.
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111. M. Drangova, Y. Zhu, B.S. Bowman, N.J. Pelc: In Vitro Validation of Phase-contrast Measurements of Myocardial Wall Motion. Proc. SMR, p 1476, 1994.
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151. Y. Zhu and N.J. Pelc: A Spatiotemporal Finite Element Mesh Model of Cyclical Deforming Motion and Its Application in Myocardial Motion Analysis Using Phase Contrast MR Images. IEEE CIP Conference, Santa Barbara, CA, October 1997.
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160. Zhu Y, Herfkens RJ, Pappas G, Drace JE, Pelc NJ. A Lagrangian Strain Approach to Velocity-Based Quantification of Myocardial Function and Tissue Deformation. Proc. ISMRM p. 875, 1998.
161. GM Stevens , RF Saunders and NJ Pelc: Development of Volumetric Tomosynthesis and Tomography System. *Radiology* 209(P), 280, 1998.
162. B Madore, GH. Glover, and NJ. Pelc. UNFOLD used to Speed Up Cardiac Imaging and fMRI. Proc. ISMRM, p.90. 1999 (Young Investigator Awards).
163. B Madore, MT Alley, JO Fredrickson, and NJ Pelc: A Reduced-FOV Method for CINE MRI. Proc. ISMRM, p.391, 1999.

164. KL Wedding, MT Draney, JO Fredrickson, CA Taylor and NJ Pelc: Comparison of PC-MRI to Computational Simulations and Digital Particle Image Velocimetry. Proc. ISMRM, p. 566, 1999.
165. JO Fredrickson, FG Sommer, and NJ Pelc: Measurement of Gd-DTPA Concentration in Flowing Blood. Proc. ISMRM, p. 1204, 1999.
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167. MT Draney, KL Wedding, CA Taylor and NJ Pelc: An In Vivo Method for Measuring Vessel Wall Motion and Cyclic Strain Using Magnetic Resonance Imaging. Proc. of the First Joint BMES/EMBS Conference, p. 219, 1999.
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170. KL Wedding, MT Draney, CA Taylor, and NJ Pelc: Vessel Wall Strain with Cine Phase Contrast MR Imaging, Radiology 213(P), 478, 1999.
171. FG Sommer, MT Alley, ST Kee, CH Coulam, DM Spielman, JO Fredrickson, JH Lee and NJ Pelc: Measurement of T1 of flowing blood, extraction fraction of Gd-DTPA and single-kidney GFR using interleaved spiral acquisition. 25th Meeting of the Society of Uroradiology, March 12-17, 2000.
172. B Madore and NJ Pelc: SMASH vs SENSE, Proc. ISMRM, p. 156, 2000.
173. B Madore and NJ Pelc: A New Way to Perform 3D Time-Resolved Angiography, Proc. ISMRM, p. 697. 2000.
174. KL Wedding, MT Draney, RJ Herfkens, CK Zarins, CA Taylor and NJ Pelc: Measurements of In Vivo Vessel Wall Motion and Strain with Cine Phase Contrast MRI, Proc. ISMRM, p. 1652. 2000.
175. R Fahrig, K Butts, JA Rowlands, R Saunders, DL Ergun, J Stanton, ST Kee, BL Daniel and NJ Pelc: On the Feasibility of Integrating a Flat-Panel X-Ray Fluoroscopy System into an Open MRI System, Proc. ISMRM, p. 1333, 2000.
176. R Fahrig, GM Stevens, EG Solomon, and NJ Pelc: On the Feasibility of Using the Scanning-Beam Digital X-Ray System (SBDX) for Lung Nodule Screening. World Congress on Medical Physics and Biomedical Engineering (Chicago, July 2000), WE-B307-05.
177. P Lazarev, M Paukshto, N Pelc, A Sakharova: Human Tissue X-Ray Diffraction: Breast, Brain, and Prostate World Congress on Medical Physics and Biomedical Engineering (Chicago, July 2000),FR-Ea325-06.
178. GM Stevens, R Fahrig, and NJ Pelc: Filtered-Backprojection for Improved Blurring in Circular Tomosynthesis, Radiology 217(P), 314, 2000.
179. R. Fahrig, JA Rowlands, NJ Pelc, JP Stanton, RF Saunders, GM Stevens, Integrating a Flat-Panel X-ray Fluoroscopy System into an Open MRI System: Technical Considerations, Radiology 217(P), 348, 2000.
180. MT Draney, NJ Pelc, CK Zarins, CA Taylor: Calculation of Time-Dependent Vessel Strain from Cine Phase Contrast Magnetic Resonance Imaging Data. Proceedings of the ASME Summer Bioengineering Conference, 789-90, June 27 - July 1, 2001
- 181 Markl M. Sampling strategies for flow quantification with phase contrast MRI, 13th Annual International Workshop on MR Angiography, Madison, WI, Sept. 26-29, 2001.

INVITED LECTURES - Norbert J. Pelc

Lectures at major conferences:

1. Physics of Digital Radiography. American Association of Chief Residents in Radiology. New Orleans, 1981.
2. Motion Effects and their elimination. Invited lecture at the 29-th annual meeting of the American Association of Physicists in Medicine, Detroit, Med. Phys., 14, 500, 1987.
3. Phase contrast angiography and related techniques. 33-rd annual meeting of the American Association of Physicists in Medicine. Med. Phys., 18, 585, 1991.
4. Motion artifacts: Origins. 10-th Annual Meeting, Society of Magnetic Resonance in Medicine, 1991.
5. Short TR fast scanning techniques in MR. Western Neuroradiological Society, p. 57, 1991.
6. Fast MRI. 1992 Korean Radiological Society.
7. Spin preparation and manipulation techniques. 1992 AAPM Summer School entitled "The Physics of MRI"
8. Motion studies using phase contrast MRI. '92 Computers in Cardiology, Durham, NC.
9. Phase contrast applications. Plenary lecture at the Society of Magnetic Resonance Imaging, JMRI 3P, 29, 1993.
10. Imaging of cardiac dynamics. Plenary lecture at the SMRM 12th Annual Meeting. Proc SMRM 12th Annual Meeting, 214, 1993.
11. A walk through k-space. '93 RSNA refresher course. Radiology 189P, 68, 1993.
12. Assessment of regional and transmural myocardial function: Phase techniques. AHA Scientific Conference on the Application of Magnetic Resonance to the Cardiovascular System. Atlanta, 1993.
13. Basic Flow Phenomena. SMR Workshop on Cardiovascular MRI: Present and Future, p. 39, 1994.
14. Magnetic Resonance Angiography. Soc. Mag. Res. Tech., San Francisco, 1994.
15. Myocardial Mechanics: Phase Tracking. SMR Workshop on Cardiovascular MRI: Present and Future, p. 162, 1994.
16. A walk through k-space. '94 RSNA refresher course. Radiology 193P, 71, 1994.
17. Imaging myocardial dynamics with phase contrast MRI. MR '95 International Symposium - MR into it's second decade. January 25-29, 1995, Garmisch, Germany.
18. Phase Contrast and Flow Measurements. SMR mini-categorical course "Magnetic Resonance Angiography for Clinical Radiologists", August 22-25, 1995, Nice, France.
19. A Walk Through K-Space. '95 RSNA refresher course. Radiology 197P, 108, 1995.
20. Motion Effects in MRI. Workshop on MR Signal Processing. October 18-20, 1996, Urbana-Champagne.
21. Status of Coronary Flow Measurement Technology. NHLBI Working Group on MRI in Clinical Cardiology, October 28-29, 1996, Bethesda, MD.
22. Flow Quantification with Phase Contrast MRI. MR '97 International Symposium. January 22-26, 1997, Garmisch-Partenkirchen, Germany.
23. K-Space: The Final Frontier?. 1997 ISMRM, April 14, 1997, Vancouver, BC, Canada.
24. K-Space. 1998 ISMRM, April 20, 1998, Sydney, Australia.
25. Medical Imaging. Third National Biomedical Engineering Career Symposium, sponsored by the Whitaker Foundation, Baltimore, MD, June 1998.
26. The Role of the IACUC Chair. Public Responsibility in Medicine and Research (PRIM&R), March, 1999.
27. More is Usually More: The Future of High Field MRI. Plenary Lecture – ISMRM, May 1999.
28. Acquisition Parameters and Image Quality. ISMRM educational program entitled MR Physics and Techniques for Clinicians, May 1999.
29. Cardiovascular Magnetic Resonance Imaging. American Physical Society Meeting. Bulletin of the American Physical Society, 45, 174-175, 2000.

30. EBCT, Multidetector CT, and the Continuing Evolution. Screening CT: Concepts and Strategies. Newport Beach, CA, Sept 8-9, 2001.
31. CT Screening: Radiation Safety Issues. Screening CT: Concepts and Strategies. Newport Beach, CA, Sept 8-9, 2001.
32. Techniques for Cardiovascular MRI. The Cardiovascular System in Health and Disease: Fundamental Concepts for the Medical Device Industry, Stanford, CA, Sept 19-21, 2001.
33. Cardiovascular CT Imaging. The Cardiovascular System in Health and Disease: Fundamental Concepts for the Medical Device Industry, Stanford, CA, Sept 19-21, 2001.

Post-graduate lectures and visiting professorships (selected)

1. Sampling Aspects in MRI. Presented at "Advanced Techniques in MRI" sponsored by Duke University, Kiawah Is., SC, 1987.
2. Motion and flow effects in MRI. Presented at "Advanced Techniques in MRI" sponsored by Duke University, Kiawah Is., SC, 1987.
3. Flow techniques in Magnetic Resonance. Presented at "Advanced Techniques in MRI" sponsored by Duke University, Kiawah Is., SC, 1988.
4. Phase Contrast Physics. In "Current Concepts of Magnetic Resonance" sponsored by Stanford University and Duke University. Silverado, Oct. 1991.
5. Quantitative Phase Contrast MRI. Seoul National University Hospital.
6. Phase Contrast MR Imaging of Motion. Tian Tan Hospital, Beijing, China.
7. Vascular Imaging of the Body. In MRI: A State of the Art Clinical Review sponsored by Stanford University School of Medicine, San Francisco, May 1992.
8. The Fourier Transform and its Application in MRI. In "Concepts of Magnetic Resonance" sponsored by Duke University and Stanford University. Kiawah Is, 1992.
9. Basics of Phase Contrast MRA. In Vascular Imaging and Intervention sponsored by Stanford University School of Medicine, San Francisco, 1992.
10. Advanced Phase Contrast Techniques. In Vascular Imaging and Intervention sponsored by Stanford University School of Medicine, San Francisco, 1992.
11. New Techniques in Cardiac MRI. In Diagnostic Imaging Update sponsored by Stanford University School of Medicine, 1993.
12. MR Angiography Principles. 6th Annual MRI Symposium presented by Hoag Memorial Hospital Presbyterian.
13. Understanding K-space. Visiting Professor, Dept of Radiology, Hospital of the University of Pennsylvania, April 1993.
14. MR Imaging of Myocardial Motion. Palo Alto Medical Foundation, Feb 2, 1993
15. Phase contrast methods for flow and motion analysis. Symposium: Hemodynamics and Atherosclerosis, Stanford University, July 28, 1993.
16. Phase contrast imaging of motion. Radiology Grand Rounds, University of Chicago, May 10, 1994.
17. Vascular Imaging and Flow Quantitation. "MRI: Third Annual State of the Art Clinical Review", May 2-6, 1994, San Francisco.
18. Fast Imaging Principles. "MRI: Third Annual State of the Art Clinical Review", May 2-6, 1994, San Francisco.
19. K-space View of Spatial Encoding, "Current Concepts of Magnetic Resonance", October 19-23, 1994, Monterey.
20. Tradeoffs Between Spatial Resolution, FOV and SNR, "Current Concepts of Magnetic Resonance", October 19-23, 1994, Monterey.
21. Fast Gradient Echo Imaging, "Current Concepts of Magnetic Resonance", October 19-23, 1994, Monterey.
22. Pulse sequences and image contrast. "MR Technologist Symposium and Registry Review", February 11-12, 1995, Stanford, CA.
23. Special procedures I - Flow and MRA. "MR Technologist Symposium and Registry Review", February 11-12, 1995, Stanford, CA.
24. Fast imaging. "Concepts of Magnetic Resonance". June 19-23, 1995, Kiawah Is, S.C.

25. Motion studies with MR. "Concepts of Magnetic Resonance". June 19-23, 1995, Kiawah Is, S.C.
26. Resolution, FOV and SNR, "Current Concepts of Magnetic Resonance", October 22-26, 1995, Monterey.
27. Spatial Encoding. "Concepts of Magnetic Resonance". June 24-28, 1996, Kiawah Is, S.C.
28. Flow Quantification with Phase Contrast MRI. Invited lecture, University of Zurich, January 21, 1997.
29. Fast MR Imaging of Flow and Motion. July 10, 1997, Hamamatsu Medical College, Hamamatsu, Japan.
30. Rapid Cardiovascular MRI, Nihon Medical College, July 11, 1997, Tokyo, Japan.
31. Radiology Research at Stanford, Hong Kong College of Radiology, July 19, 1997, Hong Kong.
32. Advances in Body MRI, Tan Tock Seng Hospital, July 28, 1997, Singapore.
33. Magnetic Resonance Angiography, National University Hospital, July 29, 1997, Singapore.
34. Time-of-Flight Angiography Physics. "Current Concepts of Magnetic Resonance," October 6-10, 1997, Monterey, CA.
35. Special Techniques: MTC, FLAIR, DWI. "Concepts of Magnetic Resonance," June 23-27, 1997, Kiawah Island, SC..
36. K-Space View of MR Imaging. "Concepts of Magnetic Resonance", June 1999, Kiawah Island, SC.
37. Faster Imaging: Fast Spin Echo & Echo Planar. "Concepts of Magnetic Resonance", June 1999, Kiawah Island, SC.
38. Introduction to Nuclear Magnetic Resonance. "Current Concepts of Magnetic Resonance", October 1999, Monterey, CA.
39. MR Angiography Techniques. "Current Concepts of Magnetic Resonance", October 1999, Monterey, CA.
40. Cardiac Imaging Methods. "Current Concepts of Magnetic Resonance", October 1999, Monterey, CA.

U.S. PATENTS ISSUED - Norbert J. Pelc

1. H.E. Daniels, F. Bernstein, T.W. Lambert, and N.J. Pelc: Multiple voltage x-ray switching system, U.S. Patent 4,361,901, filed Nov 18, 1980, issued Nov. 30, 1982.
2. N.J. Pelc and S.W. Flax: Method and Apparatus for generating time gain compensation control signal for use in ultrasonic scanner and the like, U.S. Patent 4,452,085, filed Apr. 19, 1982, issued June 5, 1984.
3. S.J. Riederer and N.J. Pelc: Matched filter for x-ray temporal subtraction, U.S. Patent 4,504,908, filed Mar. 15, 1982, issued Mar. 12, 1985.
4. J.M. Sandrik and N.J. Pelc: Film based dual energy radiography, U.S. Patent 4,513,078, filed Oct. 13, 1983, issued Apr. 23, 1985.
5. S.W. Flax and N.J. Pelc: Method and a means for determining ultrasonic wave attenuation in tissue using zero crossing detector functioning within a specified frequency band, U.S. Patent 4,515,163, filed Mar. 2, 1984, issued May 7, 1985.
6. N.J. Pelc: Film based dual energy radiography, U.S. Patent 4,526,862, filed Oct. 13, 1983, issued July 2, 1985.
7. G.H. Glover and N.J. Pelc: Method and apparatus for compensating CT images for truncated projections, U.S. Patent 4,550,371, filed Sept. 27, 1982, issued Oct. 29, 1985.
8. G.H. Glover, D.G. DallaPiazza, and N.J. Pelc: Sampled data CT system including analog filter and compensating digital filter, U.S. Patent 4,554,633, filed Sept. 30, 1982, issued Nov. 19, 1985.
9. N.J. Pelc and G.H. Glover: Method for reducing image artifacts due to projection measurement inconsistencies, U.S. Patent 4,580,219, filed May 2, 1983, issued Apr. 1, 1986.
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