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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:

06/04-present Professor
 Department of Bioengineering
 Stanford University

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 Award : (Madore, 1999), (Markl, 2003)
 RSNA Research Fellow Award (Fahrig, 2001), (Reeder, 2002), (Markl, 2002), (Reeder, 2004)
 ARRS President's Award: (Reeder, 2001)
 AAMI Young Investigator Award: (Wen, 2004)
 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 (1999-2002)
 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) (1993-2000)
AHA Council on Cardiovascular Radiology (1993-2000)
AHA Committee on New Imaging Modalities (1993-2000)
American Association for the Advancement of Science (AAAS) (1996-2001)

10. Review activity:

Journals:

JMRI, Radiology, Medical Physics, Mag. Res. Med.,

Abstracts to annual meetings:

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 (1999-2003)

11. Editorial Boards:

Medical Physics, JMRI

PUBLICATIONS - Norbert J. Pelc

Journals articles:

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.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.
3. 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.
4. 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.
5. G.H. Glover and N.J. Pelc: Non-linear partial volume artifacts in x-ray computed tomography. *Med. Phys.*, 7, 3, 1980.
6. 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.
7. 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.
8. 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.
9. 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.
10. 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.
11. 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.
12. 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.
13. 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.
14. 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.
15. 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.
16. 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.
17. G.H. Glover and N.J. Pelc: An algorithm for the reduction of metal clip artifacts in CT reconstructions. *Med. Phys.*, 8, 6, 1981.
18. S.J. Riederer, B.F. Belanger, G.S. Keyes and N.J. Pelc: Iodine sensitivity of digital imaging systems. *Proc. SPIE*, 314, 1981.

19. 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.
20. 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.
21. 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.
22. 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.
23. 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.
24. 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.
25. 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.
26. 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.
27. 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.
28. 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.
29. 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.
30. 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.
31. 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.
32. C.R. Crawford, J.G. Colsher and N.J. Pelc: High speed reprojection and its applications. *Proc. SPIE*, 914, 311, 1988.
33. 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.
34. 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.
35. J.N. Lee, S.J. Riederer, and N.J. Pelc: Flow compensated limited flip angle MR angiography. *Mag. Res. Med.*, 12, 1-13, 1989.
36. 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.

37. 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.
38. 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.
39. 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
40. 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.
41. 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.
42. 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.
43. 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.
44. 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.
45. 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.
46. 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.
47. 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.
48. D.R. Enzmann and N.J. Pelc: Brain motion: measurement with phase-contrast MR Imaging. *Radiology*, 185, 653-660, 1992.
49. 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.
50. 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.
51. 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.
52. 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.
53. N. J. Pelc: Optimization of flip angle for T₁ dependent contrast in MRI. *Magn. Reson. Med* 29, 695-699, 1993.
54. 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.

55. 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.
56. 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.
57. 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.
58. D.R. Enzmann and N.J. Pelc: Cerebrospinal fluid flow measured by phase contrast cine MR. *AJNR*, 14, 1301-1307, 1993.
59. 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.
60. 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.
61. 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.
62. 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.
63. 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.
64. 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.
65. 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.
66. J.E. Drace and N.J. Pelc: Measurement of skeletal muscle motion *in-vivo* with phase contrast MR imaging. *JMRI*, 4, 157-163, 1994.
67. J.O. Fredrickson and N.J. Pelc: Time resolved MR imaging by automatic data segmentation. *JMRI*, 4, 189-196, 1994.
68. 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.
69. 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.
70. 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.
71. 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.

72. 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.
73. 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.
74. 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.
75. 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.
76. J.E. Drace and N.J. Pelc: Tracking the motion of skeletal muscle with velocity-encoded MR Imaging. *JMRI* 4, 773-778, 1994.
77. 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.
78. L.R. Pelc, J. Sayre, K. Yun, L.J. Castro, R.J. Herfkens, D.C. Miller and N.J. Pelc: Evaluation of myocardial motion tracking using cine phase contrast magnetic resonance imaging. *Invest. Radiol.* 29, 1038-1042, 1994.
79. A.T. Lee, G.B. Pike and N.J. Pelc: Three-point phase-contrast velocity measurements with increased velocity-to-noise ratio. *Mag Res Med* 33, 122-126, 1995.
80. 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.
81. 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.
82. 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.
83. 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.
84. 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.
85. N.J. Pelc and T. Sumanaweera: Reply to T1 weighted signal contrast optimization by RF pulses (Letter). *Mag Res Med* 34, 134-135, 1995.
86. J-R Liao, F.G. Sommer, R.J. Herfkens, and N.J. Pelc: Cine spiral imaging. *Mag Res Med* 34, 490-493, 1995.
87. 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.
88. Y. Zhu Y, M. Drangova and N.J. Pelc: Fourier tracking of myocardial motion using Cine-PC data. *Mag Res Med* 35, 471-480, 1996.
89. J.O Fredrickson and N.J. Pelc: Temporal resolution improvement in dynamic imaging. *Mag Res Med* 35, 621-625, 1996.
90. M. Drangova, B.S. Bowman and N.J. Pelc: Physiological motion phantom for MRI applications. *JMRI* 6, 513-8, 1996.
91. 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.
92. 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.

93. J-R Liao, J.M. Pauly, T.J. Brosnan and N.J. Pelc: Reduction of motion artifacts in cine MRI using variable-density spiral trajectories. *Mag Res Med* 37, 569-575, 1997.
94. M. Drangova, Y. Zhu and N.J. Pelc: Effect of artifacts due to flowing blood on the reproducibility of phase-contrast measurements of myocardial motion. *JMRI* 7, 664-668, 1997.
95. J-R Liao, J.M. Pauly and N.J. Pelc: MRI using piecewise-linear spiral trajectory. *Mag Res Med*, 38, 246-252, 1997.
96. N.J. Pelc: Optimisation of flip angle for T1 dependent contrast: A closed form solution (Letter). *Magn Res Med*, 38, 518, 1997.
97. M.A. Bernstein, X.J. Zhou, J.A. Polzin, K.F. King, A. Ganin, N.J. Pelc and G.H. Glover: Concomitant gradient terms in phase contrast MR: Analysis and correction. *Mag Res Med*, 39, 300-308, 1998.
98. Y. Zhu, M. Drangova and N.J. Pelc: Estimation of deformation gradient and strain from Cine-PC velocity data. *IEEE Trans. Med. Imaging* 16, 840-851, 1998.
99. M.T. Alley, R.Y. Shifrin, N.J. Pelc and R.J. Herfkens: Ultra-fast contrast-enhanced 3D MR angiography - State of the Art. *Radiographics* 18, 273-286, 1998.
100. M.T. Alley, G.H. Glover and N.J. Pelc: Gradient characterization using a Fourier transform technique. *Magn. Res. Med.* 39, 581-587, 1998.
101. F.G Sommer, G. Corrigan, J.O Fredrickson, A.M. Sawyer-Glover, J-R Liao, B. Meyers and N.J. Pelc: Measurement of Renal Blood Flow in-vivo Using Rapid Spiral Acquisition. *Radiology* 208, 729-734, 1998.
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215. M. Markl, R. Bammer, M.T. Alley, M.E. Moseley, G.H. Glover, and N.J. Pelc : Generalized Modeling of Gradient Field Non-Linearities and Reconstruction of Phase Contrast MRI Measurements. Proceedings of the ISMRM 11th Annual Meeting, p. 1027, 2003.
216. C. Lew, and N.J. Pelc: Artifacts Caused by Transient Effects in Multi-Shot EPI. Proceedings of the ISMRM 11th Annual Meeting, p. 1040, 2003.
217. S.B. Reeder, J.H. Brittain, A. Shimakawa, Z. Wen, G.E. Gold, and N.J. Pelc: Imaging of Articular Cartilage at 3T with Multi-Point "Dixon" Fat-Water Separation and SSFP. Proceedings of the ISMRM 11th Annual Meeting, p. 1515, 2003.
218. F.P. Chan, J.M. Levin, M.T. Alley, R.J. Herfkens, and N.J. Pelc: Combined Evaluation of Ventricular Wall Motion and Delayed Myocardial Enhancement Using a 3D-CINE Technique. Proceedings of the ISMRM 11th Annual Meeting, p. 1609, 2003.
219. Reeder SR, Markl M, Hellinger J, Yu H, Herfkens RJ and Pelc NJ: Multi-Coil Cardiac CINE Imaging with "Dixon" Fat-Water Separation and Steady-State Free Precession. RSNA '03, p. 332, 2003.
220. Ganguly A, Fahrig R, Wen Z, and Pelc NJ: X-ray Image Quality Assessment in X-ray/MR Hybrid System. RSNA '03, p. 391, 2003.
221. Hellinger J, Draney M, Markl M, Pelc NJ and Herfkens RJ: Application of Cine Phase Contrast Magnetic Resonance Imaging and SPAMM-Tagging for Assessment of Endoleaks and Aneurysm Sac Motion RSNA '03, p. 543, 2003.
222. Reeder SR, Shimakawa A, Brittain J, Yu H, Pelc NJ and Gold G: Multi-Point "Dixon" Fat-Water Separation with Steady-State Free Precession at 3T: Application to Musculoskeletal Imaging RSNA '03, p. 656, 2003.
223. Gilat Schmidt T, Fahrig R, Pelc NJ: A 3D Reconstruction Algorithm for an Inverse Geometry Volumetric CT System with a Large Array Scanned Source RSNA '03, p. 691, 2003.
224. Mazin, SR, Schmidt TG, Solomon EG, Fahrig R and Pelc NJ: Geometry analysis of an inverse geometry volumetric CT system with multiple detector arrays. SPIE Medical Imaging Conference, 5368-40, 2004
225. Schmidt TG, Fahrig R and Pelc NJ: Noise simulations for an inverse geometry volumetric CT system. SPIE Medical Imaging Conference, 5368-52, 2004.
226. GE Gold, SB Reeder, H Yu, A Shimakawa, JW Johnson, NJ Pelc, CF Beaulieu1, JH Brittain. Rapid Cartilage Morphology at 3.0T: Comparison of FS-SPGR, FS-SSFP, and "Dixon" SSFP Imaging. Proceedings of the ISMRM 12th Annual Meeting, p. 209, 2004.
227. H Yu, SB Reeder, M Markl, NJ Pelc. Single Acquisition Water Fat Separation for SSFP Cardiac CINE Imaging: Feasibility Study. Proceedings of the ISMRM 12th Annual Meeting, p. 263, 2004.
228. SB Reeder, CA McKenzie, M Markl, H Yu, NJ Pelc, JH Brittain. Parallel Cardiac CINE Imaging: Application to "Dixon" Water-Fat Separation and Steady-State Free Precession. Proceedings of the ISMRM 12th Annual Meeting, p. 267, 2004.

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230. V Rieke, A Ganguly, GC Scott, BL Daniel, JM. Pauly, R Fahrig, NJ Pelc, K Butts. X-Ray Compatible RF-Coil for MR Imaging. Proceedings of the ISMRM 12th Annual Meeting, p. 379, 2004.
231. SB Reeder, Z Wen, H Yu, AR Pineda, A Shimakawa, JH Brittain, GE Gold, CF Beaulieu, NJ Pelc. Asymmetric Echoes for Robust Fast Spin-Echo "Dixon" Water-Fat Separation. Proceedings of the ISMRM 12th Annual Meeting, p. 696, 2004.
232. SB Reeder, H Yu, A Shimakawa, JH Brittain, JW Johnson, NJ Pelc, GE Gold. "Dixon" Water-Fat Separation for Musculoskeletal Imaging with Fast Spin-Echo at 3T. . Proceedings of the ISMRM 12th Annual Meeting, p. 813, 2004.
233. CA McKenzie, SB Reeder, A Shimakawa, NJ Pelc, Jean Brittain. Abdominal Three Point Dixon Imaging with Self Calibrating Parallel MRI. . Proceedings of the ISMRM 12th Annual Meeting, p. 917, 2004.
234. Z Wen, R Fahrig, NJ Pelc. Permanent Magnet Shimming for the X-Ray Detector in a Hybrid X-Ray/MR System. Proceedings of the ISMRM 12th Annual Meeting, p. 971, 2004.
235. AR Pineda, Z Wen, SB Reeder, H Yu, NJ Pelc. Cramér-Rao Bounds for 3-Point Dixon Imaging. Proceedings of the ISMRM 12th Annual Meeting, p. 2107, 2004.
236. SB Reeder, M Markl, H Yu, JC Hellinger, RJ Herfkens, NJ Pelc. Cardiac CINE Imaging with "Dixon" Water-Fat Separation and Steady-State Free Precession. Proceedings of the ISMRM 12th Annual Meeting, p. 2566, 2004.
237. M Markl, MT Draney, MD Hope, JM Levin, MT Alley, FP Chan, NJ. Pelc, RJ Herfkens. Time-Resolved 3D Velocity Mapping in the Thoracic Aorta: Three-Directional Blood Flow Patterns in Healthy Volunteers and Patients. . Proceedings of the ISMRM 12th Annual Meeting, p. 2586, 2004.
238. H Yu, SB Reeder, A Shimakawa, GE Gold, NJ Pelc, JH Brittain. Implementation and Noise Analysis of Chemical Shift Correction for Fast Spin Echo Dixon Imaging. . Proceedings of the ISMRM 12th Annual Meeting, p. 2686, 2004.
239. A Ganguly, D Mayer, R Fahrig, NJ Pelc. Contrast Agent Optimization for Imaging with MR/X-Ray Hybrid Systems. Proceedings of the ISMRM 12th Annual Meeting, p. 2691, 2004.
240. R Fahrig, ST Kee, BL Daniel, A Ganguly, Z Wen, K Butts, MD Dake, NJ Pelc. TIPS using Truly Hybrid X-Ray/MR Guidance. Proceedings of the ISMRM 12th Annual Meeting, p. 2692, 2004.
241. M Markl, MT Draney, JM Levin, EE Williamson, NJ Pelc, D Liang, DC Miller, RJ Herfkens. Time-Resolved 3D Magnetic Resonance Velocity Mapping Of Aortic Outflow In Volunteers And Patients After Valve Sparing Aortic Root Replacement. 30th Annual Meeting of the Western Thoracic Surgical Association, June 23-26, 2004.

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.
34. Future Directions and Strategic Frontiers: Imaging Technologies, RSNA/ARR/AAPM Workshop on NIBIB - Update for Radiological Scientists, Nov. 9, 2001, Bethesda, MD
35. A truly hybrid x-ray/MR system for interventional guidance , 4th Interventional MRI Symposium, Leipzig, Germany , Sept. 27 2002
36. Hybrid x-ray/MR system and other hybrid imaging modalities , SPIE Annual Meeting, Feb. 16, 2003.
37. Phase contrast techniques for measuring velocity and flow, ISMRM Annual Meeting, July 2003.

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.
41. Helical CT, "Concepts of Magnetic Resonance and Computed Tomography", June 2001, Kiawah Island, SC., June 2001.
42. EBCT, Multidetector CT, and the Continuing Evolution. "Screening CT: Concepts & Strategies", Sept. 8-9, 2001, Newport Beach, CA
43. CT Screening: Radiation Safety Issues. "Screening CT: Concepts & Strategies" , Sept. 8-9, 2001, Newport Beach, CA
44. Cardiovascular MR Imaging Techniques, "Cardiovascular System in Health and Disease: Fundamental Concepts for the Medical Device Industry", Stanford University, Sept. 19-21, 2001
45. Cardiovascular CT Techniques, " Cardiovascular System in Health and Disease: Fundamental Concepts for the Medical Device Industry", Stanford University, Sept. 19-21, 2001
46. Physical Principles of Helical CT, "Concepts of Magnetic Resonance and CT", June 2002, Kiawah Island, SC.

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.
10. N.J. Pelc: Method of projection reconstruction imaging with reduced sensitivity to motion-related artifacts, U.S. Patent 4,581,581, filed June 30, 1983, issued Apr. 8, 1986.
11. G.H. Glover and N.J. Pelc: Method and Apparatus for removing objects from CT images, U.S. Patent 4,590,558, filed Dec. 30, 1981, issued May 20, 1986.
12. G.H. Glover and N.J. Pelc: Method for correcting image distortion due to gradient nonuniformity, U.S. Patent 4,591,789, filed Dec. 23, 1983, issued May 27, 1986.
13. J.M. Sandrik and N.J. Pelc: Film based dual energy radiography, U.S. Patent 4,603,428, filed Jan. 4, 1985, issued July 29, 1986.
14. N.J. Pelc: Method for removing the effects of baseline error components in NMR imaging applications, U.S. Patent 4,612,504, filed Nov. 21, 1984, issued Sept. 16, 1986.
15. G.T. Gullberg and N.J. Pelc: Attenuation compensated emission reconstruction with simultaneous attenuation factor evaluation, U.S. Patent 4,633,398, filed Dec. 7, 1983, issued Dec. 30, 1986.
16. A.K. Collins, N.J. Pelc, and S.T. Wallenslager: Altering spatial characteristics of a digital image, U.S. Patent 4,653,013, filed Nov. 19, 1984, issued Mar. 24, 1987.
17. N.J. Pelc and G.H. Glover: Method of reducing image artifacts due to periodic signal variations in NMR imaging, U.S. Patent 4,663,591, filed Aug. 16, 1985, issued May 5, 1987.
18. G.H. Glover and N.J. Pelc: Rephasing of phase encoding gradients, U.S. Patent 4,665,365, filed Jan. 7, 1985, issued May 12, 1987.
19. G.H. Glover and N.J. Pelc: Method for magnetic field gradient eddy current compensation, U.S. Patent 4,698,591, filed Jan. 3, 1986, issued Oct. 6, 1987.

20. N.J. Pelc and G.H. Glover: Method of reducing image artifacts due to periodic signal variations in NMR imaging, U.S. Patent 4,706,026, filed Aug. 16, 1985, issued Nov. 10, 1987.
21. N.J. Pelc and G.H. Glover: Method for fast scan cine MRI imaging, U.S. Patent 4,710,717, filed Dec. 29, 1986, issued Dec. 1, 1987.
22. G.H. Glover and N.J. Pelc: Apparatus and method for evenly distributing events over a periodic phenomenon, U.S. Patent 4,720,678, filed Sep. 10, 1986, issued Jan. 19, 1988.
23. G.H. Glover, N.J. Pelc, and J.R. MacFall: Method for acquiring MR data with periodic variations, U.S. Patent 4,751,462, filed May 26, 1987, issued June 14, 1988.
24. N.J. Pelc: Use of repeated gradient echoes for noise reduction and improved NMR imaging, U.S. Patent 4,896,113, filed June 16, 1989, issued Jan. 23, 1990.
25. G.H. Glover, N.J. Pelc, and K.M. Bradshaw: Gradient and Polarizing Field Compensation, U.S. Patent 4,950,994, filed Mar. 7, 1988, issued Aug. 21, 1990.
26. N.J. Pelc: Variable bandwidth multiecho NMR imaging, U.S. Patent 4,952,876, filed Oct. 12, 1989, issued Aug. 28, 1990.
27. R.S. Stormont, J.P. Noonan, and N.J. Pelc: RF synthesizer for an NMR instrument, U.S. Patent 4,952,877, filed Aug. 11, 1989, issued Aug. 28, 1990.
28. C.C. Scheid, J.A. McFaul, D.L. McDaniel, N.J. Pelc and D.M. Barrett: Scanning mammography system with reduced scatter radiation, U.S. Patent 4,969,174, filed Sept. 6, 1989, issued Nov. 6, 1990.
29. R.S. Stormont, M.C. Anas and N.J. Pelc: Radio frequency receiver for a NMR instrument, U.S. Patent 4,992,736, filed Aug. 4, 1989, issued Feb. 12, 1991.
30. C.R. Crawford and N.J. Pelc: Method for reducing motion induced image artifacts in projection imaging, U.S. Patent 4,994,965, filed Nov. 23, 1988, issued Feb. 19, 1991.
31. M. O'Donnell, K.B. Welles, C.R. Crawford, N.J. Pelc, and S.G. Karr: Method and apparatus for coherent imaging system, U.S. Patent 5,005,419, filed June 16, 1988, issued Apr. 9, 1991.
32. N.J. Pelc and S.W. Flax: Method and apparatus for predicting values of a varying periodic phenomenon, U.S. Patent 5,051,903, filed Aug. 14, 1989, issued Sept. 24, 1991.
33. N.J. Pelc and G.G. Glover: Encoding for NMR Phase Contrast Flow Measurement, U.S. Patent 5,093,620, filed Aug. 9, 1990, issued Mar. 3, 1992.
34. N.J. Pelc: Rapid flow measurement using an NMR imaging system, U.S. Patent 5,101,156, filed Aug. 9, 1990, issued Mar. 31, 1992.
35. N.J. Pelc: Noninvasive myocardial motion analysis using phase contrast MRI maps of myocardial velocity, U.S. Patent 5,195,525, filed Nov. 26, 1990, issued Mar. 23, 1993.
36. M.A. Bernstein and N.J. Pelc: Phase correction of complex difference processed magnetic resonance angiograms, U.S. Patent 5,226,418, filed Aug. 1, 1992, issued July 13, 1993.
37. N.J. Pelc: System for selective material imaging, U.S. Patent 5,253,282, filed Apr. 27, 1992, issued Oct. 12, 1993.
38. N.J. Pelc: Method of noninvasive motion analysis by using forced closure of phase contrast MRI maps of velocity, U.S. Patent 5,257,625, filed Apr. 9, 1992, issued Nov. 2, 1993.
39. N.J. Pelc, D.C. Noll and J.M. Pauly: Method of noninvasive myocardial motion analysis using bidirectional motion integration in phase contrast MRI maps of myocardial velocity, U.S. Patent 5,257,626, filed July 28, 1992, issued Nov. 2, 1993.
40. N.J. Pelc: Reduced field-of-view system for imaging compact embedded structures, U.S. Patent 5,299,248, filed Apr. 22, 1993, issued Mar. 29, 1994.
41. S.M. Song, S.A. Napel and N.J. Pelc: Flow measurement of incompressible fluid using divergence free constraint, U.S. Patent 5,309,100, filed Oct. 30, 1992, issued May 3, 1994.

42. N.J. Pelc: Method and apparatus for tracking of deformable regions by phase contrast MRI, U.S. Patent 5,318,026, filed Aug. 11, 1993, issued June 7, 1994.
43. N.J. Pelc and T.J. Brosnan: Phase-contrast MRI using phased-array multi-coil, U.S. Patent 5,399,970, filed Aug. 11, 1993, issued Mar. 21, 1995.
44. J.M. Pauly, D.M. Spielman, C.H. Meyer, A. Macovski and N.J. Pelc: Apparatus and method for RARE echo imaging using k-space spiral coverage, U.S. Patent 5,402,067, filed Aug. 4, 1993, issued Mar. 28, 1995.
45. H. Hu, A.H. Pfoh and N.J. Pelc: Reconstruction method for helical scanning computed tomography apparatus with multi-row detector array employing overlapping beams, U.S. Patent 5,430,783, filed Jan. 26, 1993, issued July 4, 1995.
46. A.H. Pfoh, N.J. Pelc and T.L. Toth: Detector channel gain calibration using focal spot wobble, U.S. Patent 5,430,785, filed Apr. 11, 1994, issued July 4, 1995.
47. H. Hu, N.J. Pelc and A.H. Pfoh: Projection domain reconstruction method for helical scanning computed tomography apparatus with multi-column detector array employing overlapping beams, U.S. Patent 5,469,486, filed Nov. 8, 1993, issued Nov. 21, 1995.
48. N.J. Pelc: Reduced field-of-view CT system for imaging compact embedded structures; method of generating a tomographic image, U.S. Patent 5,485,492, filed Mar. 22, 1994, issued Jan. 16, 1996.
49. C.R. Crawford, M.G. Eash, S.P. Souza, N.J. Pelc, D.G. DallaPiazza, D.S. Small, R.S. Stormont: Detection and elimination of wide bandwidth noise in MRI signals, U.S. Patent 5,525,906, filed July 11, 1994, issued June 11, 1996.
50. N.J. Pelc: Reduced field-of-view system for imaging compact embedded structures, U.S. Patent 5,533,080, filed May 8, 1995, issued Sept. 2, 1996.
51. H. Hu and N.J. Pelc: Systems, methods and apparatus for reconstructing images in a CT system implementing a helical scan, U.S. Patent 5,559,847, filed Dec. 6, 1995, issued Sept. 24, 1996.
52. N.J. Pelc and Y. Zhu: MRI tracking of cyclical motion by Fourier integration of velocity fields, U.S. Patent 5,615,677, filed Aug. 4, 1995, issued Apr. 1, 1997.
53. N.J. Pelc and J.O. Fredrickson: Method and apparatus for improved temporal resolution in dynamic MRI, U.S. Patent 5,653,233, filed Aug. 11, 1995, issued Aug. 5, 1997.
54. S.M. Song and N.J. Pelc: Iterative method for determining trajectory of a moving region in a moving material using velocity measurements in a fixed frame of reference, U.S. Patent 5,680,862, filed Feb. 1, 1995, issued Oct. 28, 1997.
55. N.J. Pelc and S.G. Hushek: Method for increasing temporal resolution of MR fluoroscopy, U.S. Patent 5,697,370, filed Jan. 17, 1996, issued Dec. 16, 1997.
56. M.A. Bernstein, X. Zhou, K.F. King, A. Ganin, G.H. Glover, N.J. Pelc, and J.A. Polzyn: Correction of artifacts caused by Maxwell terms in phase contrast imaging. U.S. Patent 5,998,996, filed March 27, 1997, issued Dec. 7, 1999.
57. M.T. Alley and N.J. Pelc: Gradient characterization using Fourier transform. U.S. Patent 6,066,949, filed November 19, 1997, issued May 23, 2000.
58. B. Madore, G.H. Glover and N.J. Pelc: More efficient data encoding in dynamic magnetic resonance imaging. U.S. Patent 6,144,873, filed April 17, 1998, issued November 7, 2000.
59. M.T. Alley and N.J. Pelc: Method for temporally resolved, three-dimensional MR volume acquisitions. U.S. Patent 6,185,447, filed March 26, 1998, issued February 6, 2001.
60. Y. Zhu and N.J. Pelc: Spatiotemporal finite element method for motion analysis with velocity data. U.S. Patent 6,236,738, filed October 1, 1998, issued May 22, 2001.
61. B. Madore and N.J. Pelc: Reduced field-of-view method for cine magnetic resonance imaging. U.S. Patent 6,353,752 B1, filed May 14, 1999, issued March 5, 2002.

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