

ALAN C. NELSON, Ph.D.

EDUCATION

University of Southern California
Bachelors in Physics, 1972
University of California, Berkeley
Masters in Geophysics, 1976
University of California, Berkeley
Doctorate in Biophysics, 1980

PATENTS > 63

PUBLICATIONS > 100

HONORS

Arthur D. Little Research Initiation Award, 1983
W. M. Keck Foundation Endowed Chair, 1983
Graduate Student Council Teaching Award, 1984
American Nuclear Society Outstanding Professor Award, 1984
Rickover Professorial Fellow in Physics, 1986
Visiting Fellow, The British Royal Society, 1986
Honorary Professor, Queens University of Belfast, 1986
Honorary Professor, Trinity College of Dublin, 1986
IBM Supercomputing Award, National 1st Prize, 1990
ISO 9000 Quality System Standards Certification, 1994
FDA GMP/QSR Quality Process Certification, 1995
Fellow, American Institute for Medical and Biological
Engineering, 1998-current

FACULTY APPOINTMENTS

1980-1985 Assistant Professor, Department of Nuclear Engineering, MIT
1981-1986 Director, Whitaker Laboratory of Biomedical Imaging, MIT
1983-1986 Endowed Chair in Biomedical Engineering, W.M. Keck Foundation, MIT
1985-1986 Associate Professor, Department of Nuclear Engineering
1985-1986 Associate Professor, Joint Appointment in Health Sciences and
Technology, Harvard
1986-1991 Associate Professor, Center for Bioengineering, UW
Adjunct Associate Professor, Departments of Pathology, Radiology, and
Electrical Engineering and Computer Science, UW
1989 Tenure Granted, UW
1990-1991 Director, Center for Information Systems Optimization, UW
1991-2004 Affiliate Professor, Center for Bioengineering, UW
2004-current Affiliate Professor, Dept. of Mechanical Engineering, UW
2009-current Professor, Dept. of Bioengineering, ASU
2009-current Director, the Biodesign Institute, ASU

POSITIONS IN INDUSTRY

1988 Founder, NeoPath, Inc., Bellevue, WA
1989-1991 Chairman, NeoPath, Inc., Bellevue, WA
1991-1999 President and CEO, NeoPath, Inc., Redmond, WA
1999-2000 Executive Chairman, TriPath Imaging, Inc., Burlington, NC
2001-current Founder, Chairman and CEO, VisionGate, Inc., Gig Harbor, WA

INDUSTRIAL CONSULTING

1983-1985 Bolt, Beranek and Newman, Inc., MA
1984-1985 Exxon Research and Engineering Corp., NJ
1984-1986 Mobil Research and Development Corp., TX
1984-1986 Collaborative Research, Inc., MA
1985-1988 Siemens Medical Systems, Inc., NJ
1986-1988 Quantum Medical Systems, Inc., WA

GOVERNMENT COMMITTEES AND PROFESSIONAL SERVICE

1981-1982 International Committee for Space Research (COSPAR)
1983 National Cancer Institute Advisory Panels
1984-1986 Swedish Embassy, Office of Science and Technology, Science Advisor
1985-1989 National Institutes of Health, Special Study Sections
1985-1988 Heavy Ion Research Organization, Lawrence Berkeley Laboratory,
Consulting Physicist
1985-1987 Editor, Scanning Electron Microscopy Journal
1986 Session Head, International Conference on Vascular Imaging
1987-1989 Board of Reviewers, J. Computer Vision
1989-1992 Reviewer, SPIE - Medical Imaging
1989-1996 Reviewer, IEEE - Trans. on Medical Imaging
1995-1997 Director, Washington Biotech and Biomed Association (WBBA)
1996-1998 Director, Washington Technology Center, UW
1996-2008 Director, Technology Alliance of Washington
1997-1998 Board of Governors, Northwest Industry Partnership
1999-2006 Board of Advisors, Conus Fund, NY (a hedge fund)
2003-2005 Alliance of Angles, WA (professional investment group)
2004-2005 Committee Chair, Pioneered New Washington State Ethics Law
2005-2006 Board of Directors, Perceptronix Medical, Inc., BC, Canada
2005-2008 Chairman of the Board, MedaMetric, Inc., NY
2005-2008 Executive Board, Technology Alliance of Washington

PARTIAL PATENT RECORD (U.S. Patents Only)

Issued

Nelson AC, Jeromin LS “Signal Amplification by Charging and Illuminating a Partially Developed Latent Electrostatic Image” U.S. Patent No. **3,981,727**, September 21, 1976.

Nelson AC, Jeromin LS “Signal Amplification by Charging and Illuminating a Partially Developed Latent Electrostatic Image” (Divisional) U.S. Patent No. **4,038,943**, August 2, 1977.

Nelson AC “Scanning Electron Microscope for Visualization of Wet Samples” U.S. Patent No. **4,720,633**, January 19, 1988.

Johnson RH, Nelson AC, Fisher RM “Three-Dimensional Microtomographic Analysis System” U.S. Patent No. **5,402,460**, March 28, 1995.

Lee S-JJ, Nelson AC, Nelson LA, Youngmann CE, Frost KL “Method for Cytological System Dynamic Normalization” U.S. Patent No. **5,627,908**, May 6, 1997.

Nelson AC, Lee S-JJ, Johnston RS “Method for Identifying Normal Biomedical Specimens” U.S. Patent No. **5,787,188**, July 28, 1998.

Nelson AC, Lee S-JJ “Method for Testing Proficiency in Screening Images of Biological Slides” U.S. Patent No. **5,797,130**, August 18, 1998.

Lee S-JJ, Oh S, Patten SF, Nelson AC, Nelson LA “Method for Highly Efficient Computer Aided Screening” U.S. Patent No. **5,799,101**, August 25, 1998.

Lee S-JJ, Nelson AC “Method and Apparatus for Maskless Semiconductor and Liquid Crystal Display Inspection” U.S. Patent No. **6,122,397**, September 19, 2000.

Lee S-JJ, Nelson AC, Youngmann C “Interactive Method and Apparatus for Sorting Biological Specimens” U.S. Patent No. **6,252,979**, June 26, 2001.

Nelson AC “Apparatus and Method for Imaging Small Objects in a Flow Stream Using Optical Tomography” U.S. Patent No. **6,522,775**, February 18, 2003.

Nelson AC “Optical Projection Imaging System and Method for Automatically Detecting Cells Having Nuclear and Cytoplasmic Densitometric Features Associated with Disease” U.S. Patent No. **6,519,355**, February 11, 2003.

Chu C-W, Nelson AC “Optical Tomography of Small Objects Using Time Delay and Integration Imaging” U.S. Patent No. **6,591,003**, July 8, 2003.

Nelson AC, Chu C-W, Webster RW “Optical Projection Imaging System and Method for Automatically Detecting Cells with Molecular Marker Compartmentalization Associated with Malignancy” U.S. Patent No. **6,636,623**, October 21, 2003.

Rahn JR, Nelson AC “Method and Apparatus for Three Dimensional Imaging in the Fourier Domain” U.S. Patent No. **6,741,730**, May 25, 2004.

Nelson AC “Tomographic Reconstruction of Small Objects Using *A Priori* Knowledge” U.S. Patent No. **6,697,508**, February 24, 2004.

Nelson AC “Method and Apparatus for Emission Computed Tomography Using Temporal Signatures” U.S. Patent No. **6,770,893**, August 3, 2004.

Johnson RH, Nelson AC “Optical Tomography of Small Objects Using Parallel Ray Illumination and Post-Specimen Optical Magnification” U.S. Patent No. **6,944,322**, September 13, 2005.

Fauver M, Nelson AC “Flow-through Drum Centrifuge” U.S. Patent No. **6,991,738**, January 31, 2006.

Nelson AC “Variable-Motion Optical Tomography of Small Objects” U.S. Patent No. **7,197,355**, March 27, 2007.

Rahn JR, Nelson AC “Method for Correction of Relative Object-Detector Motion Between Successive Views” U.S. Patent No. **7,260,253**, August 21, 2007.

Pending

Nelson AC, Patten FW “Automated Cell Sample Enrichment Preparation Method” U.S. Patent **Allowed**.

Fauver ME, Seibel EJ, Rahn JR, Nelson AC “Method and Apparatus for Imaging with a Scanning Focal Plane” U.S. Patent Pending.

Fauver ME, Rahn JR, Seibel EJ, Nelson AC “Method and Apparatus of Shadowgram Formation for Optical Tomography” U.S. Patent Pending.

Fauver ME, Nelson AC, Rahn JR, Seibel EJ “System and Method for Processing Specimens and Images for Optical Tomography” U.S. Patent Pending.

Fauver ME, Nelson AC, Rahn JR, Seibel EJ, Patten FW, McGuire S “System and Method for Preparation of Cells for 3D Image Acquisition” U.S. Patent Pending.

Fauver ME, Nelson AC “Optical Projection Tomography Microscope” U.S. Patent Pending.

Fauver ME, Seibel EJ, Meyer MG, Nelson AC, Rahn JR, Neumann T, Johnson RH
“Focal Plane Tracking and Its Improvements for Microtomography” U.S. Patent
Pending.

Hayenga JW, Nelson AC “Cantilevered Coaxial Flow Injector Apparatus and Method for
Sorting articles” U.S. Patent Pending.

ABBREVIATED BIBLIOGRAPHY

JOURNAL ARTICLES

Nelson AC, Hayes TL, Tobias CA, Yang TC “Structural Damage in Retina by Heavy Ion
Radiation” Scan. Electron Microsc. IV:79-85, 1981.

Nelson AC, Tobias CA “Rapid Development of Corneal Lesions in Rats Produced by
Heavy Ions” Adv. Space Res. 3(8):195-209, 1983.

Levy RJ, Schoen FJ, Levy JT, Nelson AC, Howard SL, Oshry LJ “Biologic Determinants
of Dystrophic Calcification and Osteocalcin Deposition in Glutaraldehyde-Preserved
Porcine Aortic Valve Leaflets Implanted Subcutaneously in Rats” Am. J. Pathol.
113(2):143-155, 1983.

Nelson AC, Shah-Yukich A, Babayan RK “Radiation Damage in Rat Kidney
Microvasculature” Scan. Electron Microsc. III:1273-1277, 1984.

Nelson AC, Schoen FJ, Levy RJ “Quantitative Scanning Electron Microscopy
Methodology for Study of the Pathophysiology of Calcification in Bioprosthetic
Heart Valves” Scan. Electron Microsc. I:209-213, 1985.

Schoen FJ, Levy RJ, Nelson AC, Bernhard WF, Nashef A, Hawley M “Onset and
Progression of Experimental Bioprosthetic Heart Valve Calcification” Lab Invest.
52(5):523-532, 1985.

Nelson AC, Wyle HR “Morphological Changes in Neutron Irradiated Red Blood Cells”
Scan. Electron Microsc. IV:1623-1630, 1985.

Nelson AC “Computer-aided Microtomography in Electron Microscopy” J. Histochem.
Cytochem. 34(1):57-60, 1986.

Nelson AC “Theory for Calcium-Phosphate Crystal Formation in Tissue from Scanning
Electron Microscope Data” Scan. Electron Microsc. I:151-156, 1986.

- Rosnick S, Kennedy D, Laub G, Nelson A, Braeckle G, Dzik S, Bachus R, Starewicz P "Three-Dimensional Display of Blood Vessels in MRI" IEEE/Comp. in Cardio, 193-196, 1986.
- Kennedy DN, Nelson AC "Three-Dimensional Display from Cross-Sectional Tomographic Images: An Application to Magnetic Resonance Imaging" IEEE/Trans. Med. Imag, MI-6: 134-140, 1987.
- Nelson AC "Study of Rat Lung Alveoli using Corrosion Casting and Freeze Fracture Methods Coupled with Digital Image Analysis" Scan. Microsc. 1(2):817-822, 1987.
- Shah-Yukich A, Nelson AC "Characterization of Solid Tumor Microvasculature: A Three-Dimensional Analysis Using the Polymer Casting Technique" Lab. Invest. 58(2):236-244, 1988.
- D'Amico AV, Nelson AC, Babayan RK "Thrombin: Implications for Intratumor Therapy against Metastasis" J. Cancer Res. Clin. Oncol. 114(2):129-132, 1988.
- Nelson AC, Kim Y, Haralick RM, Anderson PA, Johnson RH, DeSoto LA "3D Display of Magnetic Resonance Imaging of the Spine" SPIE, 902:103-112, 1988.
- Nelson AC, Hobbib WM "Microtomography from Limited Projections in Conventional TEM for 3D Reconstruction of an Intact Cell" Ultramicroscopy 25(4):293-301, 1988.
- Michael DJ, Nelson AC "HANDX: A Model-Based System for Automatic Segmentation of Bones from Digital Hand Radiographs" IEEE/Trans. Med. Imag. 8:64-69, 1989.
- Nelson AC, Kim Y, Haralick RM, Anderson PA, Johnson RH, DeSota LA "Stereo and Multiplanar Video Display of 3D Magnetic Resonance Image Data" J. Imaging Technology 15:74-78, 1989.
- Wilhelm P, Haynor DR, Kim Y, Nelson AC, Riskin EA "Lossy Image Compression for Digital Medical Imaging Systems" SPIE Medical Imaging IV, 1232:1-11, 1990.
- Lee S-JJ, Kuan L, Rosenlof M, Brancheau D, Bartels P, Nelson AC "Object Analysis and Decision Strategy in an Automated PAP Smear Prescreening System" Electronic Imaging, 90:220-223, 1990.
- Abbas B, Boyle FC, Wilson DJ, Nelson AC, Carr KE "Radiation Induced Changes in the Blood Capillaries of Rat Duodenal Villi: A Corrosion Cast, Light and Transmission Electron Microscopical Study" J. Submicrosc. Cytol. Pathol. 22(1):63-70, 1990.
- Carr KE, McCullough JS, Nunn S, Hume SP, Nelson AC "Neutron and X-ray Effects on Small Intestine Summarized Using a Mathematical Model or Paradigm" Proc. Royal Soc. London, Series B 243(1308):187-194, 1991.

- Bartoo GT, Lee JS, Bartels PH, Kiviat NB, Nelson AC "Automated Prescreening of Conventionally Prepared Cervical Smears: A Feasibility Study" *Lab. Invest.*, 66(1):116-122, 1992.
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- Winter BK, Wu S, Nelson AC, Pollack SB "Renal Cell Carcinoma and Natural Killer Cells: Studies in a Novel Rat Model *in Vitro* and *in Vivo*" *Cancer Res.* 52(22):6279-6286, 1992.
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- Brown CS, Burns DH, Spelman FA, Nelson AC "Computed Microtomography from Optical Projections for Three-Dimensional Reconstruction of Thick Object" *J. Applied Optics*, Vol 31, No. 29: 6247-6254, 1992.
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- Anderson TL, Nelson AC “Quality Control and Proficiency Testing of Cytologic Smear Screening; An Integrated Approach Using Automation” *Compendium on Quality Assurance*, 283-286, 1995.
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- Carr KE, Hume SP, Nelson AC, O’Shea O, Hazzard RA, McCullough JS “Morphological Profiles of Neutron and X-Irradiated Small Intestine” *J. Radiat. Res.* 37(1):38-48, 1996.
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- Ramon C, Czapski P, Haueisen J, Nowak H, Huntsman LL, Leder U, Brady GH, Kim Y, Nelson AC “MCG Simulations with a Realistic Heart-torso Model” *IEEE Trans. Biomed. Engr.*, 45:1323-1331, 1998.
- Fauver M, Seibel EJ, Rahn JR, Nelson AC “Development of Micro-Optical Projection Tomography for 3D Analysis of Single Cells” *SPIE*, 5324:171-181, 2004.
- Fauver M, Seibel EJ, Rahn JR, Meyer MG, Patten FW, Neumann T, Nelson AC "Three-Dimensional Imaging of Single Isolated Cell Nuclei Using Optical Projection Tomography" *Optics Express* 13(11), 4210-4223, 2005.
- Meyer MG, Fauver M, Rahn JR, Neumann T, Patten FW, Seibel EJ, Nelson AC “3D Adds the Critical Dimension to Automated Cell analysis” Accepted for Publication, *J. Pattern Recognition*, 42:141-146, 2009.
- Rahn JR, Nelson AC “Cost-Effectiveness Model for Lung Cancer Early Detection Combining Sputum Testing with CT Scans” *J. Clinical Oncology*, Submitted.
- Neumann T, Meyer M, Patten FW, Johnson FL, Erozan YS, Frable WJ, Gupta PK, Zaman MB, Nelson AC “Premalignant and Malignant Cells in Sputum from Lung-Cancer Patients” *Cancer Cytopathology*, Submitted.

GOVERNMENT REPORTS AND BOOK CHAPTERS

Nelson AC, Tobias CA Cellular Heavy Ion Effects, Lawrence Berkeley Laboratory (LBL) #11140, Berkeley, CA, June 1980.

Nelson AC, Theoretical and Observational Analysis of Individual Ionizing Particle Effects in Biological Tissue, PhD Dissertation, LBL #11147, Berkeley, CA, 1980.

Tobias CA, Malachowski MJ, Nelson AC, Philpott DE, Thermophysical Lesions Caused by HZE Particles, LBL #11220, Berkeley, CA, 1980.

Nelson AC, Hayes TL, Tobias CA, Yang TC “Some Indications of Structural Damage in Retina by Heavy Ion Radiation” in Ultrastructural Effects of Radiation on Tissues and Cells, pp 161-166, ed. Carr KE and Seed TM, SEM, Chicago, IL, 1983.

Nelson AC “Biological Effects of Ionizing Radiation” Ch. 12 pp221-236 in The Nuclear Almanac, Ed. Dennis J, Addison-Wesley Pub. Co., MA, 1984.

PROCEEDINGS

Nelson AC, Hayes TL, Tobias CA “Scanning Electron Microscope Study of Membrane Lesions Caused by Individual Heavy Ions” Proceedings of the Radiation Research Society, Gd-11, June 1980.

Wyle HR, Nelson AC “In-vitro Neutron Effects on Erythrocytes” Proceedings of the American Nuclear Society, November 1981.

Nelson AC, Tobias CA “Rapid Development of Corneal Lesions in Rats produced by Accelerated Heavy Ions” Proceedings of the XXIV Plenary Meeting of COSPAR, F.2.2, February 1982.

Shah AA, Nelson AC “Preliminary Studies of Gamma-Irradiated Tumor Microvasculature of Rat Kidney Using Polymer Casting Technique” Proceedings of Radiation Research Society, Bd-9, February 1983.

Babayan RK, Nelson AC, Shah AA, Krane RJ “Polymer Casting Technique for the Study of Normal and Abnormal Renal Vasculature” Proceedings of the American Urological Association, #165, April 1983.

Schoen FJ, Levy RJ, Nelson AC, Bernhard WF, Hasef A, Hawley M “Bioprosthetic Heart Valve Failure, Pathogenesis of Calcific Deposits” J. Am. Coll. Cardio. 3:601, February 1984.

Babayan RK, Nelson AC, and D'Amico AV, “Renal Adenocarcinoma Vascular Studies Using SEM” Proceedings of the Surgical Forum, 1985.

- Nelson AC, Shah AA "Tumor Vasculature: An SEM Study of Corrosion Casts" Proceedings of Scanning Electron Microscopy, 1985.
- Nelson AC, Strong CAH "Vascular Casting of Heart" Proceedings of Scanning Electron Microscopy, 1985.
- Babayan RK, Nelson AC, D'Amico AV "A Novel Approach to the Study of Microvasculature in Solid Tumors" Surgical Forum of the American College of Surgeons, 34:639-641, 1985.
- D'Amico AV, Nelson AC "Analysis of Solid Tumor Microvasculature in the Study of the Metastatic Process" Proceedings of the Radiation Research Society, Hi-9, May 1985.
- Nelson AC "A Repair Ploidy Model (RPM) for Cell Survival after Irradiation" Proceedings of the Radiation Research Society, Ic-10, May 1985.
- Nelson AC "Theory for Biocalcification" Proceedings of Scanning Electronic Microscopy, 1985.
- Nelson AC "Three Dimensional Microtomography in Biological Research" Proceedings of the Histochemical and Cytochemical Society, 1985.
- Nelson AC, Wyle HR "Neutron Irradiation of Red Blood Cells: an SEM Study" Proceedings of Scanning Electron Microscopy, 1985.
- Halpern HJ, Teicher BA, Downey EM, van Polen J., Nelson AC, Weichselbaum RR "Imaging Electron Spin Resonance (ESR) for the Noninvasive Measurement in Vivo of Radiobiologically Significant Levels of Tissue Hypoxia" Proceedings of the Radiation Research Society, En-7, April 1986.
- D'Amico AV, Nelson AC "Thrombin: Potential Applications in Cancer Treatment" Proceedings of the Radiation Research Society, Fh-16, April 1986.
- D'Amico AV, Nelson AC, Babayan RK "A Possible Role of Tumor Vasculature in Metastasis" Proceedings of the American Urological Association, #29, September 1986.
- Nelson AC "Quantitative Microcorrosion Casting of Rat Lung to Measure Alveolar Vascular Surface Area" Scanning Electron Microscopy, October 1986.
- Rosnick S, Dzik S, Starewicz P, Nelson AC, Kennedy D "Three Dimensional Display of Blood Vessels in MRI" Computers in Cardiology, October 1986.

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- Nelson AC, Kim Y "3-D Spine" SPIE 3-D Graphics, January 1988.
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- Winter BK, Nelson AC "Metastatic Time Course Studies of a Rat Renal Adenocarcinoma" Critical Determinants in Cancer Progression and Metastasis, M.D. Anderson Cancer Center, March 1989.
- Johnson RJ, Nelson AC, Haralick RM "Optimal Information Retrieval from Complex Low Frequency Backgrounds in Medical Images" IEEE Engineering in Medicine and Biology, 11, November 1989.
- Brown CS, Nelson AC, Spelman FA "Three-Dimensional Reconstruction of the Cochlea" IEEE Engineering in Medicine and Biology, 11, November 1989.
- Ching LSL, Nelson AC, Richards TL, Gordon D "A Quantitative Comparison between Magnetic Resonance Imaging and Histology of Atherosclerosis in the Carotid Artery" IEEE Engineering in Medicine and Biology, 11, November 1989.
- Winter BK, Pollack SB, Nelson AC "Evidence for Immunosuppression in the RKC Model" First International Symposium on Immunobiology of Renal Cell Carcinoma, November 1989.
- Johnson RH, Nelson AC, Goodsitt MM "Supercomputer Simulation of CT" 75th Annual RSNA, Radiology 173:415 November 1989.
- Bartoo GT, Nelson AC, Lee S-JJ "Automated Microimaging Systems for Pathology Laboratories" Proceedings of SPIE Conference on Medical Imaging, May 1990.
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- Carr KE, McCullough JS, McCallion W, Steele J, Nelson AC, Hanson W "Morphological Effects of Radioprotectants on Different Intestinal Cells" 9th International Congress on Radiation Research, Jan. 1991.
- Lee JS, Hwang JN, Davis DT, Nelson AC "Integration of Neural Networks and Decision Tree Classifiers for Automated Cytology Screening" Proceedings of the International Joint Conference on Neural Networks, 1:257-262, July 1991.
- Meyer MG, Ramon C, Nelson AC, Spelman FA, Lamping J "Biomagnetic Image Reconstruction in Three-Dimensions" 8th International Conference on Biomagnetism, August 1991.
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Lung Cancer Risk,” Proceedings of the 10th World Conference on Lung Cancer (Vancouver, B.C., Canada, August 2003).

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Seibel EJ, Patten FW, Meyer MG, Nelson AC “3D Optical Imaging of Epithelial Cells from Human Sputa,” Proceedings from the 15th World Congress for Bronchology and 15th World Congress for Bronchoesophagology, March 30 – April 2, 2008, Tokyo, Japan.

Neumann T, Miao Q, Yu J, Fauver M, Meyer MG, Seibel EJ, Nelson AC “Simultaneous 3D Imaging of Morphology and Nanoparticle Distribution in Single Cells with Cell-CT Technology,” Engineering in Medicine and Biology Conference Proceedings, August 20-24, 2008, Vancouver, B.C., Canada.

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