

CURRICULUM VITAE — SANDY NAPEL

September 2019

Home Address:

Work Address: Department of Radiology
James H. Clark Center
318 Campus Drive, Room S323
Stanford, CA 94305-5450

Date of Birth: February 23, 1952

Place of Birth: New York, USA

Citizenship: USA

Marital Status: Married

Degrees

1974	SUNY at Stony Brook B.S.	Engineering Sciences
1976	Stanford University M.S.	Electrical Engineering
1981	Stanford University Ph.D.	Electrical Engineering

Principal Positions Held — Academic

1972-74	Brookhaven National Laboratory Department of Applied Sciences Upton, New York USA	Research Assistant
1976-77	Stanford University Department of Electrical Engineering Stanford, California USA	Teaching Fellow
1978-79	Stanford University Department of Electrical Engineering Stanford, California USA	Acting Instructor
1977-81	Stanford University Department of Electrical Engineering Stanford, California USA	Research Assistant
1981-88	University of California Department of Radiology San Francisco, California USA	Adj. Asst. Professor
1988-91	University of Western Ontario, Dept. of Diagnostic Radiology and Nuclear Medicine London, Ontario Canada	Visiting Asst. Professor

1991-97	Stanford University Departments of Radiology, and Electrical Engineering (by courtesy) Stanford University Medical School Stanford, California USA	Assistant Professor
1997-03	Stanford University Departments of Radiology, and Electrical Engineering (by courtesy) Medicine (by courtesy) Stanford University Medical School Stanford, California USA	Associate Professor
2003-	Stanford University Departments of Radiology, and Electrical Engineering (by courtesy) Medicine (by courtesy) Stanford University Medical School Stanford, California USA	Professor
1996-	co-Director, Radiology 3D and Quantitative Imaging Lab Stanford University Department of Radiology	
2008-2019	co-Division Chief, Integrative Biomedical Imaging Informatics Stanford University Department of Radiology	
2019-	Division Chief, Integrative Biomedical Imaging Informatics Stanford University Department of Radiology	
2015-	co-Chair, Appointments and Promotions Committee Stanford University Department of Radiology	
2019-	Chair, Appointments and Promotions Committee Stanford University Department of Radiology	

Principal Positions Held — Industrial

Imatron, Inc.

389 Oyster Point Blvd.

So. San Francisco, California 94080:

1981-83	Manager of Computer Systems
1983-84	Director of Computer Science
1984-86	Associate VP of Computer Science
1986-87	VP of Computer Science
1987-89	VP of Engineering

Honors and Awards

1972	Tau Beta Pi (SUNY Stony Brook Chapter President 1973-74)
1974	SUNY Stony Brook Engineering Commencement Valedictorian
1988-89	Medical Research Council of Canada: Visiting Scientist Award

- 1989-90 National Sciences and Engineering Research Council of Canada: Visiting Industrial Fellowship
- 1991 Society of Computed Body Tomography *Cum Laude* Award for Presentation: Optimization of Breath-held Pulmonary Magnetic Resonance Angiography
- 1992 Stanford University William M. Hume Faculty Scholar Award
- 1992 Radiological Society of North America *Magna Cum Laude* Award for Scientific Exhibit: Abdominal Spiral CT Angiography: A Minimally Invasive Three-Dimensional Alternative to Arteriography.
- 1992 Radiological Society of North America *Certificate of Merit* Award for Scientific Exhibit: SMaRT: A Computer-based MR Teaching File
- 1993 Society of Computed Body Tomography *Cum Laude* Award for Presentation: 3D CT Angiography of Renal Artery Stenosis
- 1994 Society of Computed Body Tomography *Cum Laude* Award for Presentation: MRI of Pulmonary Embolism using Intravascular Contrast-enhanced 3D Fast Gradient Echo Technique in a Canine Model
- 1994 Society of Computed Body Tomography *Cum Laude* Award for Presentation: Pre- Operative Assessment of Living Renal Donors: Spiral CT as an Alternative to Conventional Angiography and Intravenous Urography
- 1994-97 Radiology Editor's *With Distinction* Recognition Award
- 1995 Uroradiology Society *Grand Prize* for Presentation: Reformatted Non-contrast Spiral CT in the Evaluation of Renal Colic
- 1996 Society of Computed Body Tomography *Cum Laude* Award for Presentation: Optimization of CT Parameters for Virtual Colonoscopy
- 1998 Society of Computed Body Tomography *Hounsfield* Award for Outstanding Paper: Volumetric Quantification of the Aorta and Its Branches: A Unique Application for CT Angiographic Data
- 1998 Society of Computed Body Tomography *Cum Laude* Award for A Better Gold Standard for Evaluation of Visualization Modes in CT Colonography
- 1998 Giovanni Di Chiro Award (1997) for Outstanding Scientific Research for paper: Comparison and Evaluation of Retrospective Intermodality Brain Image Registration Techniques, *J Comput Assist Tomogr*, **21**(4):554-566, 1997.
- 1999 Society of Computed Body Tomography *Cum Laude* Award for Multidetector spiral CT Colonography: maintaining image quality with rapid acquisition.
- 1999 RSNA *Research Trainee Prize* for Helical Artifacts in 1-Slice and 4-Slice CT: Quantitative and Qualitative Effects of Scanning Parameters and Object Position on a Simulated Blood Vessel Phantom

- 2000 Society of Computed Body Tomography *Hounsfield Award for Outstanding Scientific Paper* : Computer-Aided Polyp Detection Improves Reading Efficiency in CT Colonography
- 2001 RSNA *Research Trainee Prize* for Curved Thin Slab Maximum Intensity Projections (CTS-MIP): Method and Evaluation for CT Angiography.
- 2002 SCBT/MR *Hounsfield Award for Outstanding Scientific Paper*: Automated Detection of Pulmonary Nodules
- 2006 Society of Nuclear Medicine “Image of the Year” award for article: ‘Flying Through’ and ‘Flying Around’ a PET/CT scan: Pilot Study and Development of 3D Integrated 18F-FDG PET/CT for Virtual Bronchoscopy and Colonoscopy, J Nucl Med **47**:1081-1087, 2006.
- 2006 SCBT/MR *Hounsfield Award for Outstanding Scientific Paper*: Knowledge-based Algorithm for Automated Centerline Interpolation through Femoro-Popliteal Artery Occlusions in Peripheral CT Angiography (CTA)
- 2007 SCBT/MR *In Training Award for Best Young Investigator*: Promises and Limitations of Dual-Energy CT in Lower Extremity CT Angiography
- 2007 Society of Nuclear Medicine “Best Clinical Article”: ‘Flying Through’ and ‘Flying Around’ a PET/CT scan: Pilot Study and Development of 3D Integrated 18F-FDG PET/CT for Virtual Bronchoscopy and Colonoscopy, J Nucl Med **47**:1081-1087, 2006.
- 2009 Elected to the College of Fellows of the American Institute for Medical and Biological Engineering (AIMBE).
- 2012 Academy of Radiology Research 2012 Distinguished Investigator Award

Memberships in Professional Organizations

- 1972- Institute for Electrical and Electronics Engineers (IEEE): Acoustics, Speech and Signal Processing Society Social Implications of Technology Society
- 1991- American Association of Physicists in Medicine (AAPM)
- 1991-95 Society of Magnetic Resonance in Medicine (SMRM)
- 1991-95 Society of Magnetic Resonance Imaging (SMRI)
- 1995-2005 International Society of Magnetic Resonance in Medicine (ISMRM) (merger of SMRM and SMRI)
- 1995- Radiological Society of North America (RSNA)

Committee Membership

National

- 1994 American Association of Physicists in Medicine, Local Arrangements Chairman
- 1996-2000 Member, Program Committee, AAPM

- 1998-2002 Member, Program Committee, RSNA
- 2001-2002 Chair: Physics subcommittee of the Program committee, RSNA
- 2000 CARS 2000 Executive Committee
- 2004-2009 American College of Radiology Imaging Network (ACRIN) National Lung Screening Trial (NLST) Computer-aided detection (CAD) Working Group
- 2019-2023 American Association of Physicists in Medicine, Machine Learning Subcommittee (MLSC)

Local

- 1993 Radiation Producing Machine Committee, Stanford University School of Medicine
- 1993 Co-Chair Committee on Teleradiology - Department of Radiology, Stanford University School of Medicine
- 1997 Committee on Inter-School Collaboration and Future Alliances
- 1999 Steering Committee, Medicine Meets Virtual Reality at Stanford

Review Activities

Scientific Journals

- 1989- Referee for Medical Physics
- 1993- Referee for Radiology
- 1994- Referee for IEEE Transactions on Medical Imaging
- 1995- Referee for Journal of Computer Assisted Tomography
- 2000- Referee for IEEE Transactions on Biomedical Engineering
- 2002- Referee for Medical Image Analysis
- 2009- Associate Editor, Medical Image Analysis
- 2011- Associate Editor, Radiology
- 2014- Associate Editor, Journal of Medical Imaging

Abstracts for Scientific Meetings

- 1992,94 Referee for Siggraph Conference
- 1993-2005 Referee for Radiological Society of North America Conference
- 1994 Referee for Visualization in Biomedical Computing Conference
- 1995 Referee for Volume Visualization '96 Conference
- 1999 Referee for World Conference on Medical Physics 2000
- 2000, 2010- Referee for MICCAI program, workshops

Teaching

- 1976-80 EE 274: The Computer as a Laboratory Instrument. Department of Electrical Engineering, Stanford University. Full responsibility for course.
- 1989-90 Biophysics 515A: Medical Imaging. University of Western Ontario. Lecturer.

- 1989-90 Biophysics 516B: Imaging Principles. University of Western Ontario. Lecturer.
- 1989-90 Physics of Radiology for Radiology Residents. Department of Diagnostic Radiology and Nuclear Medicine, University of Western Ontario. Lecturer.
- 1992-2012 Physics for Radiology Residents—Board Review. Stanford University School of Medicine. Lecturer and course director.
- 1993-2012 Radiological Physics. Stanford University School of Medicine. Lecturer.
- 1993-2006 Current Concepts of Magnetic Resonance, Post-graduate course hosted by Stanford University Medical School and Duke Medical Center. Laguna Niguel, CA (1993) and Monterey, CA (1994-). Faculty.
- 1994 Diagnostic Imaging Update, Post-graduate course hosted by Stanford University Medical School. Maui, HI. Faculty.
- 1994 Vascular Disease 1994: Diagnosis and Treatment. Post-graduate course hosted by Stanford University Medical School. Monterey, CA. Faculty.
- 1995 American Association of Physicists in Medicine Summer School: CT and US Technology and Applications. New London, CT. Faculty.
- 1997 Computed Tomography Update, Post-graduate course hosted by Stanford University Medical School. Jackson Hole, WY. (Basic Principles of Spiral CT, Basic Principles of CT Angiography)
- 1997 Advances in Electron Beam Computed Tomography, Hilton Head, SC, October 3-5, 1997
- 1999-2014 Annual International Symposium on Multidetector-Row CT. (various lectures on Principles of Multi Detector-Row CT, Data Explosion, virtual colonoscopy, CAD, visualization, decision support, etc.)
- 1999 Computed Tomography Update, post-graduate course hosted by Stanford University Medical School. Jackson Hole, WY. (Basic Principles of Spiral CT, Basic Principles of Multidetector CT, Basic Principles of CT Angiography)
- 1999 Short Course in Medical Imaging and Image Processing, Erlangen, Germany, October 14, 1999. (Basics and Applications of Post-processing Methods)
- 2000 Stanford University Course MIS 210-B—Medical Imaging. Medical Image Visualization (1/19/2000)
- 2000 Southeast Area Chapter of the American Association of Physicists in Medicine: Spring Symposium—Spiral & Multi-slice CT: Physical Principles & Medical Physicist Responsibilities (Multidetector CT: Interpretation, Display, and 3D Imaging Considerations) (3/16/2000)
- 2000 Stanford University Course ME 187/388/CS 123/MIS 187/287—Biomedical Computation: Opportunities and Challenges. Medical Image Visualization (3/29/2000)

- 2002-8 Stanford University Course ME-284, Cardiovascular Bioengineering. Lecture: CT Imaging with Applications to Vascular Disease, Winter Qtr.
- 2003 Diagnostic Imaging Update, post-graduate course hosted by Stanford University Medical School and Keio University. Poipu Beach, Kauai, HI. (Volumetric CT: MDCT and Beyond, MDCT Data Explosion I: The Problem and Potential Solutions for Vascular CT, MDCT Data Explosion II: Potential Solutions for Cancer Detection), March 17-21.
- 2005 Diagnostic Imaging Update, post-graduate course hosted by Stanford University Medical School and Keio University. Poipu Beach, Kauai, HI. (Basic Principles of Multidetector CT: Four Slices and Beyond; Managing Image Overload using Advanced Visualization and Computer-Aided Navigation; CAD for CT: Concepts, Current Status, and Future Prospects), March 28-April 1.
- 2009 Diagnostic Imaging Update, post-graduate course hosted by Stanford University Medical School and Keio University. Wailea, Maui, HI. (CAD for CT: Concepts, Current Status, and Future Prospects, Imaging Informatics for Radiological Decision Support), March 23-27.
- 2010 RSNA 2010 Refresher Course on Decision Support in Clinical Practice: Automated Image Retrieval based on Lesion and Case Similarity. Chicago, November 2010.
- 2011-4 RSNA 2011-4 Refresher Course on Decision Support in Clinical Practice: Quantitative Image Analysis for Image Retrieval, Decision Support, and Knowledge Discovery. Chicago, November.
- 2013-5 RSNA 2013-5 Correlating Imaging with Human Genomics. Chicago, December.
- 2015-7 RSNA 2015-7 Radiomics Mini Course, From Image to Radiomics: Image Feature Computation and Considerations. Chicago, December
- 2016-7 RSNA 2016-7 Panel Discussion I: Imaging Integration with Cancer Genomics/Proteomics: Methodologies Leveraging the Cancer Imaging Archive

Graduate Student Supervision

University of Western Ontario:

Brian Reid	Ph. D.	Medical Biophysics	1989-90
thesis area: Microscopic Computed Tomography			

Stanford University:

H. Christian Davidson	M.S.	Medical Informatics*	1991-93
thesis area: Picture Archiving for Radiology			

Smadar Shiffman	Ph. D.	Medical Informatics*	1992-99
thesis area: Segmentation of Blood Vessels for CT Angiography			

Philippe G. Lacroute	Ph. D.	Electrical Engineering	1993-95
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		thesis area: Fast Volume Rendering Using a Shear-Warp Factorization of the Viewing Transform (3 rd reader)	
Chye H. Yan	Ph. D.	Electrical Engineering	1994-98
		thesis area: Serial Registration of CT Scans for Quantitative Applications	
Shin Y. Yen	Ph. D.	Electrical Engineering	1994-99
		thesis area: Resolution in Spiral CT and Volume Visualization of Medical Images	
David Paik	Ph. D.	Medical Informatics	1996-02
		thesis area: Virtual Colonoscopy — Visualization, Path Planning, CAD	
Feng Zhuge	Ph. D.	Electrical Engineering	1999-06
		thesis area: Quantification of structures in volumetric data	
Burak Gokturk	Ph. D.	Computer Science	1999-02
		thesis area: Shape Recognition with Application to Medical Imaging (2 nd reader)	
Burak Acar	Post-doc	Radiology	1999-02
		project: CAD of Colonic Polyps, Lung Nodules	
Kenneth Wang	Ph.D.	Mechanical Engineering	1999-01
		thesis area: Level Set Methods for Computational Prototyping with Applications to Hemodynamic Modeling (2 nd reader)	
Grant M. Stevens	Ph.D.	Biophysics	1999-00
		thesis area: Volumetric Tomographic Imaging (2 nd reader)	
Raghav Raman	Post-doc	Radiology	1999-03
		project: Vascular Visualization and Quantitation	
Djamila Holmlund	M.S.	Visiting Student (Sweden)	2001-02
		masters thesis: A Study on Radiological Visual Inspections and a User Study Focused on Ergonomic Input Devices.	
Ping Li	M.S.	Computer Science	2001-03
		project: Virtual Colonoscopy Supine and Prone Matching, CAD	
Padma Sundaram	Ph.D.	Electrical Engineering	2001-07
		thesis area: Virtual Colonoscopy CAD	
Michel Bilello	Post-doc	CS/Radiology	2002-03
		project: CAD for Liver Lesions	
Joyoni Dey	post-doc	Radiology	2003-05
		project: Interventional Room of the Future; registration, Human-computer interaction	
Markus Kukuk	post-doc	Radiology	2003-08
		project: Advanced interventional visualization/registration	
Rong (Cindy) Shi	post-doc	Radiology	2003-07
		project: Virtual Colonoscopy	
Shaohua Sun	Ph.D.	Electrical Engineering	2003-07
		Thesis area: CAD lung and other cancer	
Anthony Sherbondy	Ph.D.	Electrical Engineering	2002-08
		Thesis area: Advanced Visualization, Segmentation, CAD	

Tejas Rakshe	Ph.D.	Electrical Engineering	2003-08
Thesis area: Vascular Visualization			
Joong Ho Won	Ph.D.	Electrical Engineering	2004-09
Thesis area: Vascular Visualization			
Bindi-Pankhudi	M.S.	Computer Science	2004-06
A. J. Jayant Joshi	M.S.	Computer Science	2004-06
David Olsen	Ph.D.	School of Medicine	2006-07
Ushah K. K. Reddi	M.S.	Computer Science	2006-08
David Tran	M.D.	School of Medicine	2006-09
Jiajing Xu	Ph.D.	Electrical Engineering	2009-13
Thesis area: Quantitative Imaging			
Jessica Faruque	Ph.D.	Electrical Engineering	2007-14
Thesis area: Perception of Image Similarity, CBIR Systems			
Sebastian Echegaray	Ph.D.	Electrical Engineering	2013-17
Thesis area: Quantitative Imaging			
Shaimaa Bakr	M.S.	Electrical Engineering	2015-
Thesis area: Quantitative Imaging			
Austin Ray	M.S.	Computer Science	2015-6
Stephen Chu	M.S.	Computer Science	2015-6
Huafei Wang	M.S.	Computer Science	2015-6
Akshay Jaggi*	undergrad	Computer Science	2016-9

**winner of the Angela Lee Undergraduate Research Award - most outstanding poster presented at the annual Achauer Undergraduate Honors Symposium.*

Grants—Current

NIH/NCI 5T32CA009695 3/01/93 – 8/31/23
Advanced Techniques in Cancer Imaging (Preceptor: 3/01/93-12/31/2011)
Advanced Techniques in Cancer Imaging (Program Director: 1/01/12-2/31/2013)
Stanford Cancer Imaging Training (SCIT) Program (Program Director: 3/01/13-2/28/2023)
The goal of this project is to train radiologists and scientists to contribute to on-going development of cancer imaging techniques.

NIH/NCI U24 CA180927 Stanford subcontract PI 9/01/14 – 08/31/19
Informatics Tools for Optimized Imaging Biomarkers for Cancer Research & Discovery
(MGH prime)
Goal: To develop a cloud-based infrastructure for on-going quantitative comparison and evaluation of segmentation and characterization tools.

NIH/NCI U01 CA190214 co-Investigator 6/01/15 – 5/31/21
Qualification and Deployment of Imaging Biomarkers of Cancer Treatment Response

Goal: To develop an infrastructure for evaluating imaging biomarkers, repurposing imaging data to develop new image biomarkers, and facilitating the introduction of new imaging biomarkers into clinical trials.

NIH/NCI U01 CA187947-A1 Principal Investigator 9/01/15 – 8/31/20

Computing, Optimizing, and Evaluating Quantitative Cancer Imaging Biomarkers

Goal: To develop a cloud-based resource for generating image features of tumors and evaluating their absolute and relative efficacy for predicting dependent variables, such as response, survival, cancer genomics.

SPO 124869 ROYAL PHILIPS co-PI 9/01/16 – 9/15/19

Advancing Precision Health

Goal: To develop new care paradigms generally at the intersection of advanced clinical monitoring/imaging, novel diagnostic mechanisms, and predictive/prescriptive analytics.

NIH/NCI U01 CA196405 Site PI (set aside) 9/1/16 – 8/31/19 (NCX)

Radiomics and Deep Learning Approaches for Screen Detected Adenocarcinoma

Goal: To develop quantitative methods to classify CT screen detected lung nodules as aggressive vs. indolent.

NIH R01 EB020527 co-Investigator 02/15/15 - 01/31/20

Radiogenomics Framework for Non-Invasive Personalized Medicine

Goal: To develop a computational framework to identify quantitative imaging biomarkers that mirror molecular properties of tumors.

NIH/NCI R01 CA222512-01 co-Investigator 2/1/18 – 1/31/23

Multiregional imaging phenotypes and molecular correlates of aggressive versus indolent breast cancer

Goal: To develop associations linking imaging phenotypes to molecular subtypes with different prognoses.

NIH/NCI R01 CA233578-01 co-Investigator 2/1/19 – 1/31/24

Imaging and circulating DNA markers to assess early response and predict treatment failure patterns in lung cancer

Goal: To develop associations linking imaging phenotypes and circulating tumor cells to predict treatment failures in lung cancer.

Grants—Pending or to be Resubmitted

NIH co-Investigator 4/01/20 - 3/31/25

Pan-cancer platform for spatially integrated radiology and pathology images of tumors

PI: Rusu

Goal: To develop a platform for integrating radiology and pathology images of prostate and lung cancers, to map aggressive cancers from pathology to radiology, and to predict aggressive cancers on radiology images alone.

Submitted: 7/5/2019

NIH/NIBIB contact PI 07/01/19 – 06/30/24
P41: National Resource for Machine Learning in Clinical Imaging (NRMLCI)
PI: Napel & Langlotz
Goal: To develop and provide methods and data sets for the rapid creation of imaging decision support systems.
Submitted: 9/25/2018
Impact Score: 42
To be resubmitted January 2020

NIH/NCI co-Investigator 04/01/20 – 03/1/25
Radiogenomics framework for treatment response, treatment allocation and treatment monitoring
PI: Gevaert
Goal: To develop radiogenomics algorithms integrating clinical, molecular and imaging data for therapeutic purposes, focusing on the development of radiogenomic signatures that are predictive of treatment response, suggest the use of novel drugs and help during treatment monitoring.
Submitted: June 2019

NIH/NCI co-Investigator
MR imaging biomarkers to predict prognosis of invasive breast cancer
PI: Li
Goal: To develop imaging biomarkers for prognosis of invasive breast cancer
To be resubmitted

NIH/NCI (R33) co-Investigator 9/1/18 – 8/31/23
Imaging and molecular signatures to improve prognostication in early stage lung cancer
PI: Li
Goal: To develop associations linking imaging phenotypes to molecular subtypes with different prognoses.
Submitted: Feb 2018

NIH/NCI co-Investigator
Quantitative imaging biomarkers of early treatment response in NSCLC
PI: Li
Goal: To develop a radiomics profile of predicting early treatment response to radiosurgery for NSCLC.
To be resubmitted

Grants—Completed

1. Medical Research Council of Canada
Visiting Scientist Award 1988-90

- Investigator 2000-2005
16. National Institutes of Health: RO1 R01CA66785
Magnetic Resonance Imaging of Breast Cancer
Co-Investigator 2005-2005
 17. R2 Technology, Inc.
Computer Aided Tracking and Analysis of Pulmonary Nodules Over Time
Principal Investigator 2003-2005
 18. NIH/NHLBI RO1 HL67194
Efficient Interpretation of 3D Vascular Image Data
Principal Investigator 2001-2006
 19. NIH/NIBIB RO1 EB003524
Improved C-Arm CT for Interventional Procedures
Co-Investigator 2004-2007
 20. Siemens Medical Solutions
Interventional Room of the Future
Co-Investigator 2002-2006
 21. NSF ACI-205741
Simulation-Based Medical Planning for Cardiovascular Disease
Co-Investigator 2002-2007
 22. NIH/NCI R01 CA72023
Three-Dimensional Spiral CT Colonography
Co-Principal Investigator 1996-2009
 23. NIH 1 U54 GM072970-01
Physics-based Simulation of Biological Structures
Co-Investigator 2004-2009
 24. BIO-X Interdisciplinary Initiatives Program #3
A Novel Transducer Array and Intelligent Software for Automated Detection of
Asymptomatic Carotid Artery Stenosis
Principal Investigator 2006-2009
 25. NIH/SBIR 1R43RR02802001A1
Automated Bone Removal for Head and Neck CTA using Dual Energy CT
Stanford Principal Investigator 2009-2010
 26. NSF CNS-0619926
MRI: Acquisition of a Hybrid Shared-Memory / Massively-Parallel Commodity
Cluster for Cost-Effective Super-Computing at Stanford.
Investigator 2006-2011
 27. NIH R01 CA109089
Improving Radiologist Detection of Lung Nodules with CAD
Co-Principal Investigator 2005-2010
Principal Investigator 2010-2011
 28. NIH/R01 CA134720
Co-Investigator 2009-2013
Miniaturized Real-Time Volumetric Ultrasound Imaging System

29. NIH/NCI U01CA142555
Co-Investigator 2010-2016
Computerized Quantitative Imaging Assessment of Tumor Burden
30. NIH/NIBIB R01 EB014955 2013-2017
subcontract PI (Kitware, Inc.)
Accelerating Community-Driven Medical Innovation with VTK
31. NIH/NCI R01 CA160251-01 2011-2017
Principal Investigator
Tools for Linking and Mining Image and Genomic Data in Non-Small Cell Lung Cancer
32. NIH/NCI R01 EB020527 2/15/15 – 1/31/19
co-Investigator
Radiogenomics Framework for Non-Invasive Personalized Medicine

U.S. Patents

1. S.M-H. Song, S.A. Napel and N.J. Pelc: Flow measurement of incompressible fluid using divergence free constraint. (5,309,100) issued 5/3/1994.
2. T.S. Sumanaweera, S. Napel, G.H. Glover, and J.R. Adler: Method for correcting magnetic field inhomogeneity distortion in MRI images having disconnected regions (5,485,085) issued 1/16/1996.
3. C.H. Yan, R.T. Whalen, S. Napel: Method for Beam Hardening Correction in Quantitative Computed X-ray Tomography (6,324,240) issued 11/27/2001.
4. S. Shiffman, S. Napel: Object Segregation in Images (6,424,732) issued 6/23/2002.
5. J. A. Hossack, T. S. Sumanaweera, A. He, S. Napel, R. B. Jeffrey, Jr., D. Paik: Medical Diagnostic Ultrasound System and Method for Flow Analysis (6,503,202) issued 1/7/2003.
6. D.S. Paik, G.D. Rubin, C.F. Beaulieu, S. Napel, R.B. Jeffrey Jr.: Method For Detecting Shapes In Medical Images, (7,043,064), issued 5/9/2006.
7. D.S. Paik, S. Napel, G.D. Rubin, C.F. Beaulieu: Method For Characterizing Shapes In Medical Images (7,043,064 - Amendment), issued 5/9/2006.
8. R. Raman, S. Napel, G.D. Rubin: Curved Slab Maximum Intensity Projections, (7,170,517), issued 1/30/2007.
9. B. Acar, C.F. Beaulieu, S. Napel, R.B. Jeffrey, Jr., D.S. Paik: Method for Matching and Registering Medical Image Data (7,224,827), issued 5/29/2007.
10. B. Acar, C.F. Beaulieu, S. Napel, R.B. Jeffrey, Jr., D.S. Paik, S.B. Gokturk, C. Tomasi: Method for Detecting and Classifying a Structure of Interest in Medical Images, (7,272,251), issued 9/18/2007.
11. R. Raman, S. Napel, G.D. Rubin: Quantification of Aortoiliac Endoluminal Irregularity, (7,324,675), 1/29/2008.
12. R. Raman, B. Raman, S. Napel, G.D. Rubin: Quantification Method of Vessel Calcification (7,330,576), issued 2/12/2008.
13. S. B. Gokturk, C. Tomasi, B. Acar, C.F. Beaulieu, S. Napel, D. S. Paik: Three-Dimensional Pattern Recognition Method to Detect Shapes in Medical Images, (7,346,209), issued 3/18/2008.

14. R. Raman, S. Napel, G.D. Rubin: Quantification of Vascular Irregularity, (7,379,574), issued 5/27/2008.
15. R. Raman, S. Napel, G.D. Rubin: Curved Slab Maximum Intensity Projections, (7,471,814), issued 12/30/2008.
16. D.S. Paik, P. Sundaram, C.F. Beaulieu, S. Napel: Polyp Identification Through Subtraction of Models of Medical Images, (7,616,800) Issued 11/10/2009.
17. S. Sun, S. Napel: Registration System and Method for Tracking Lung Nodules in Medical Images, (7,657,073) issued 2/2/2010.
18. B. Acar, E. Konukoglu, C. F. Beaulieu, S. Napel, D. S. Paik: Heat Diffusion Based Detection of Structures Of Interest In Medical Images, (7,729, 739) issued 6/1/2010.
19. D. W. Lau, V. Yeluri, J. Hellinger, D. S. Paik, S. Napel, T. Gentles. "System and Method for Linking Current and Previous Images Based on Anatomy," (7,747,050) issued 6/29/2010.
20. S. Sun, F. Zhuge, S. Napel: Learning-Enhanced Simulated Annealing, (7,840,504) issued 11/23/2010.
21. P. Sundaram, A. Zomorodian, C. F. Beaulieu, S. Napel: Polyp Detection Using Smoothed Shape Operators," (8,055,047) issued 11/8/2011.
22. M. Kukuk, S. Napel: "System For Three-Dimensional Medical Instrument Navigation," (8,073,221) issued 12/6/2011.
23. M. Kukuk, S. Napel: "Rotational stereo roadmapping," (8,233,962) issued 7/31/2012.
24. M. Kukuk, S. Napel: "Apparatus and Method for Aligning a Light Pointer With a Medical Interventional Device Trajectory," (8,265,731) issued 9/11/2012.
25. E. J. Alexander, T. P. Andriacchi, P. Lang, S. A. Napel: Assessing the condition of a joint and preventing damage (8,265,730) issued 9/11/2012.
26. E. J. Alexander, T. P. Andriacchi, P. Lang, S. A. Napel: Assessing the condition of a joint and preventing damage (8,862,202) issued 10/14/2014.
27. M. Kukuk, S. Napel: "Needle Guidance with a Dual-Headed Laser," (9,370,627) issued 6/21/2016.
28. R. J. Gillies, S. A. Eschrich, R.A. Gatenby, P. Lambin, A, L.A.J. Dekker, S. A. Napel, S. K. Plevritis, D. L. Rubin, "Systems, Methods And Devices For Analyzing Quantitative Information Obtained From Radiological Images," (9,721,340) issued 8/1/2017.
29. R. J. Gillies, S. A. Eschrich, R.A. Gatenby, P. Lambin, A, L.A.J. Dekker, S. A. Napel, S. K. Plevritis, D. L. Rubin, "Systems, Methods And Devices For Analyzing Quantitative Information Obtained From Radiological Images," (10,339,653) issued 7/2/2019.
30. R. Raman, B. Raman, S. Napel, G.D. Rubin: Bone Removal in Medical Images, PROV/S02-275/US filed Dec. 4, 2003.
31. E. Kokuloglu, B. Acar, S. Napel, C.F. Beaulieu: Polyp Enhancing Level Sets, PROV/S04-296/US Filed Feb. 4, 2005.
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 298. S. Napel, D. L Rubin, S. John, D. Gude, S. Echegaray, S. Mattonen, S. Bakr, "The Quantitative Image Feature Pipeline (QIFP): Automated Computation of Quantitative Image Features and Construction of Predictive Models, Radiological Society of North America 104th Scientific Sessions, December 2018.
 299. S. Mattonen, G. A. Davidzon, S. Bakr, S. Echegaray, A. N. C. Leung, M. Vasanaawala, G. Horng, V. S. Nair, S. Napel, "18F FDG Positron Emission Tomography (PET) Tumor Penumbra Texture Predicts Recurrence in Non-Small Cell Lung Cancer," Radiological Society of North America 104th Scientific Sessions, December 2018.
 300. J. Wu, X. Li, X. Teng, D. L. Rubin, S. Napel, B. Daniel, R. Li, "Quantitative DCE-MRI features can complement molecular markers for predicting tumor infiltrating lymphocytes in breast cancer: model discovery and independent validation," Radiological Society of North America 104th Scientific Sessions, December 2018.
 301. K. Gifford, C. Letrong, V. Hinostroza, R. Fan, S. Napel, D. Fleischmann, "Enhancing Understanding of Pathology with 3D Printed Prostate Cutting

- Guides," Radiological Society of North America 104th Scientific Sessions, December 2018.
302. S. A. Mattonen, G. A. Davidzon, J. Benson, A. N. C. Leung, M. Vasanawala, G. Horng, J. B. Shrager, S. Napel, V. S. Nair, "Integrated Bone Marrow and Tumor Radiomics on [18F] FDG Positron Emission Tomography (PET) Augment Stage for Outcome Prediction in Non-Small Cell Lung Cancer," American Thoracic Society Annual Meeting, Dallas, TX, May 15-20, 2019.
 303. M. McNitt-Gray, S. Napel, J. Kalpathy-Cramer, A. Jaggi, D. Cherezov, D. Goldgof, H. Yang, E. Jones, M. Muzi, N. Emaminejad, M. Wahi-Anwar, Y. Balagurunathan, M. Abdalah, B. Zhao, L. Hadjiyski, L. Pierce, K. Farahani, "Standardization in Quantitative Imaging: A Comparison of Radiomics Feature Values Obtained by Different Software Packages On a Set of Digital Reference Objects, AAPM Annual Meeting July 14-18 2019, San Antonio, Tx.
 304. P. Mukherjee, A. Brezhneva, S. Napel, O. Gevaert, "Detection of Lung Cancer in subjects with positive screening CT scans in the National Lung Screening Trial (NLST) dataset by leveraging the Lung Image Database Consortium (LIDC-IDRI) dataset," *accepted; Radiological Society of North America 105th Scientific Sessions, December 2019.*
 305. S. Napel, D. Gude, T. L. Casavant, D. Cherezov, S. A. Mattonen, D. L. Rubin, "The Quantitative Image Feature Pipeline (QIFP): Automated Computation of Quantitative Image Features for Prediction of Clinical Characteristics (e.g., Malignancy, Response to Therapy, Overall Survival) in Subject Cohorts," *accepted; Radiological Society of North America 105th Scientific Sessions, December 2019.*
 306. M. F. McNitt-Gray, S. Napel, J. Kalpathy-Cramer, A. Jaggi, N. Emaminejad, M. Muzi, D. Cherezov, D. Goldgof, H. Yang, E. Jones, M. Wahi-Anwar, Y. Balagurunathan, M. Abdalah, B. Zhao, L. Hadjiiski, A. Virkid, H-P Chan, L. Pierce, K. Farahani, "Standardization in Quantitative Imaging: A Multi-center Comparison of Radiomics Feature Values Obtained by Different Software Packages on Digital Reference Objects and Patient Datasets," *accepted; Radiological Society of North America 105th Scientific Sessions, December 2019.*

Invited Articles

1. G.D. Rubin, S. Napel, "Increased Scan Pitch for Vascular and Thoracic Spiral CT." Letter to the Editor, *Radiology*, **197**(1):316-7, 1995.
2. G.D. Rubin, S. Napel, A.N. Leung, "Volumetric Analysis of Volumetric Data— Achieving a Paradigm Shift," *Editorial, Radiology* **200**(2)312-317, 1996.
3. M.L. Davila, C.F. Beaulieu, D.S. Paik, S. Napel, P.S. Edelstein, R.B. Jeffrey, Jr., "CT and MR Colonography (Virtual Colonoscopy)," *Techniques in Gastrointestinal Endoscopy*, **2**:30-36, 2000.
4. D. S. Katz, N. Venkataramanan, S. Napel. F.G. Sommer, "Low Dose Unenhanced Multidetector Helical CT for the Evaluation of Suspected Renal Colic: Can it be Routinely Utilized?" *American Journal of Roentgenology* **180**:313-315, 2003.
5. C. L. Partain, H-P Chan, J. G. Gelovani, M. L. Giger, J. A. Izatt, F. A. Jolesz, K. Kandarpa, K. C. P. Li, M. McNitt-Gray, S. Napel, R. M. Summers, and G. S.

- Gazelle, "Biomedical Imaging Research Opportunities Workshop II: Report and Recommendations," *Radiology* **236**: 389-403, 2005.
6. P. Sundaram, D.S. Paik, C.F. Beaulieu, S. Napel, "Algorithmic Colon Polyp Detection: Image Processing or Geometry Processing?" *Proc MICCAI Workshop: Computational and Visualization Challenges in the New Era of Virtual Colonoscopy*, 2008.
 7. S. Napel and M. L. Giger, "Radiomics and Imaging Genomics: Quantitative Imaging for Precision Medicine," Editorial written for Special Section on Radiomics and Imaging Genomics, *SPIE Journal of Medical Imaging*, December 2015. PMID: 26839908; PMCID: PMC4729214
 8. I. El Naqa, S. Napel, "Radiogenomics is the future of treatment response assessment in clinical oncology," *Med Phys.* 2018 Oct;45(10):4325-4328. PMID: 29863785.

Invited Presentations

1. S. Napel, "Cine Computed Tomography." IEEE Computer Society—Computer Elements Workshop. Mesa, Arizona, November 1987.
2. S. Napel, "Comparison of 3-D Results by CT and Arteriography in the Same Patient." Symposium on Coronary Artery Calcification — Detection, Quantitation and Prognostic Significance. Miami Beach, Florida, February 1989.
3. S. Napel, "Ultrafast Computed Tomography." Robarts Research Institute, London, Ontario, May 1989.
4. S. Napel, M.P. Marks, G.D. Rubin, M.D. Dake, D.R. Enzmann, C.J. Bergin, D.V. Paranjpe, R.B. Jeffrey, Jr., "CT Angiography Using Continuous Volume CT Scanning with Maximum Intensity Projections for 3D Visualization." *Advances in Ultrafast CT*, Burlingame, CA, October, 1992
5. S. Napel, "Time Sequence of Flow Information via 3DPC Simulated Streamlines," University of Michigan, Magnetic Resonance Angiography Course and Workshop. Lansing, Michigan, October 14 - 18, 1992.
6. S.A. Napel, M.P. Marks, G.D. Rubin, M.D. Dake, D.R. Enzmann, D.V. Paranjpe, R.B. Jeffrey, Jr., "Three-dimensional CT Angiography Using Spiral CT in the Brain, Neck, Chest, and Abdomen." Cardiovascular Science and Technology Conference (AAMI), Hyatt Regency Bethesda, December 12-14, 1992.
7. S. Napel, "Three-dimensional Vascular Imaging with CT and MR." Hemodynamics and Atherosclerosis Symposium, Stanford University, July, 1993.
8. S. Napel, "CT Angiography: An Update." *Advances in Ultrafast CT: 1993 Electron Beam Tomography (EBT) International Symposium*, sponsored by the University of Iowa in conjunction with the Harbor-UCLA Medical Center, Miami, Florida, October 8-10, 1993.
9. S. Napel, "MR Physics of Blood Flow." *Diagnostic Imaging Update: CT, MR, Chest and Interventional*, hosted by Stanford University, Maui, Hawaii, February 21-25, 1994.

10. S. Napel, "3D Image Reconstruction Techniques in CT and MR." Diagnostic Imaging Update: CT, MR, Chest and Interventional, hosted by Stanford University, Maui, Hawaii, February 21-25, 1994.
11. S. Napel, "Technical Considerations in Spiral CT." Diagnostic Imaging Update: CT, MR, Chest and Interventional, hosted by Stanford University, Maui, Hawaii, February 21-25, 1994.
12. S. Napel, "CT for Evaluation of Vascular Disease - How and Why." Vascular Disease 1994: Diagnosis and Treatment postgraduate course, hosted by Stanford University, Monterey, California, October 26-30, 1994.
13. S. Napel, "Fast CT: Is it Different?" American Association of Physicists in Medicine Symposium, Radiological Society of North America, Chicago, IL, November 26 - December 2, 1994.
14. S. Napel, "Computer Technology." Discussion Leader. Virtual Colonoscopy Workshop, National Institutes of Health, National Cancer Institute, Bethesda, MD, June 12, 1995.
15. S. Napel, "CT Image Reconstruction." American Association of Physicists in Medicine Summer School: CT and US Technology and Applications, New London, CT, June 25-29, 1995.
16. S. Napel, "Image Processing and 3D Displays." American Association of Physicists in Medicine Summer School: CT and US Technology and Applications, New London, CT, June 25-29, 1995.
17. S. Napel, "Computed Tomography and Magnetic Resonance Image Fusion for Stereotaxic Treatment of Brain Tumors." The Whitaker Foundation, Snowbird, Utah, August 4-6, 1995.
18. S. Napel, "Virtual Endoscopy and More." Advances in Ultrafast CT 1995: An International Symposium on Electron Beam Tomography, Scottsdale, Arizona, October, 1995.
19. S. Napel, "Virtual Endoscopy," Rapid Prototyping in Medicine and Computer Assisted Surgery, Erlangen, Germany, October 19-21, 1995.
20. S. Napel, G.D. Rubin, C.F. Beaulieu, R.B. Jeffrey, Jr., "Evaluation of Cross-sectional Medical Images using Perspective Rendering — Virtual Endoscopy." Imatron Japan EBCT Symposium, Yokohama, Japan, January 26-27, 1996.
21. S. Napel, Virtual Colonoscopy Workshop (*Follow-up of June 12, 1995 workshop to discuss feasibility of Virtual Colonoscopy for Clinical Application*), National Institutes of Health, National Cancer Institute, Bethesda, MD, March 4, 1996.
21. S. Napel, "3-D CT Imaging for Simulated Endoscopy and Intra-parenchymal Viewing." American Association of Physicists in Medicine Annual Meeting, Philadelphia, July 21-25, 1996.
23. S. Napel, Virtual Colonoscopy Workshop (*Follow-up of June 12, 1995 and March 4, 1996 workshops to discuss feasibility of Virtual Colonoscopy for Clinical Application*), National Institutes of Health, National Cancer Institute, Bethesda, MD, September 13, 1996.
24. S. Napel, "Virtual Reality: Emerging Technology for Diagnosis," College of American Pathologists, San Diego, CA, October 3, 1996.

25. S. Napel, Virtual Endoscopy Panel, MEDTEC 1997, Tysons Corner, VA, August 14-17, 1997.
26. S. Napel, "Virtual Endoscopy: Overview and Recent Developments," Rapid Prototyping in Medicine and Computer Assisted Surgery, Erlangen, Germany, October 16-18, 1997.
27. S. Napel, "Diagnostic Radiology in Three Dimensions: Present and Future," University of Chicago, Radiology Grand Rounds, September 1998.
28. S. Napel, "New Visualization Techniques for Virtual Colonoscopy," 1st International Symposium on Virtual Colonoscopy, Boston, October 1998.
29. S. Napel, "Current State of the Art EBCT 3D Imaging," Advances in Electron Beam Computed Tomography: An International Scientific Symposium, San Francisco, October 16-18, 1998.
30. S. Napel, "Diagnostic Radiology in Three Dimensions," Medicine Meets Virtual Reality at Stanford, January 23, 1999.
31. S. Napel, "Volumetric Display and Analysis of Volume Data," Joint Working Group on Image-guided Diagnosis and Treatment," National Institutes of Health (NCI) and Office of Women's Health Workshop, Washington D.C., April 12-14, 1999.
32. S. Napel, "Volumetric Imagery: Changing the Paradigm of Radiological Interpretation," University of Western Ontario, June 15, 1999.
33. S. Napel, "Volumetric Visualization of Medical Imagery: A New Paradigm for Radiology," Symposium on Visualization in Medicine, American Association of Physicists in Medicine Annual Meeting, Nashville, July 25-29, 1999.
34. S. Napel, "3D Diagnostic Radiology: Present Status and Future Direction," Rapid Prototyping in Medicine and Computer Assisted Surgery, Erlangen, Germany, October 14-16, 1999.
35. S. Napel, "Multidetector CT," Radiology Grand Rounds, November 22, 1999.
36. S. Napel, "Display and Analysis of Volumetric Medical Imagery: Towards a New Paradigm for Radiological Interpretation," Progress in Radiology Series, University of California, San Francisco, January 27, 2000.
37. S. Napel, "Computerized Detection of Polyps in CT Colonography," 14th Computer Assisted Radiology and Surgery, San Francisco, June 2000.
38. S. Napel, "Living with Thousands of Slices: Towards a New Paradigm for Radiological Interpretation," International Society for Strategic Studies in Radiology, San Francisco, August, 2001.
39. S. Napel, "Radiological Data Explosion: The Good, the Bad, and Surviving the Ugly," Rapid Prototyping in Medicine and Computer Assisted Surgery, Nurnberg, Germany, October 11-13, 2001.
40. S. Napel, G.D. Rubin, A.G. Sorensen, "Volumetric Visualization and Analysis: Introduction and Clinical Benefits," AAPM/RSNA Symposium, Arie Crown Theater, November 2002.
41. G.D. Rubin, E.K. Fishman, S. Napel, P.J. Pickhardt, "Three-dimensional Imaging: Where Are We Headed?" Special Focus Session, RSNA, November 2004.

42. S. Napel, "Linking Image features to diseases, molecular phenotypes and outcomes: methods and example in non-small cell lung cancer," S. Napel, International Symposium on BIOMEDICAL IMAGING: From Nano to Macro, San Francisco, April 8, 2013.
43. S. Napel "Spotlight Talk on Radiogenomics," World Molecular Imaging Congress, Sept. 2014, Seoul, Korea.
44. S. Napel, "Oncogene Tumor Heterogeneity Translated to Imaging: Radiomics and Radiogenomics – Decoding Tumor Phenotype using Radiomics," World Molecular Imaging Congress, Honolulu, Hawaii, Sept. 2015.
45. S. Napel, "The Rise (and Fall?) of Radiomics," Radiomics 2016, Clearwater Beach, FL, October 2016.
46. S. Napel, "Decoding Tumor Phenotype using Radiomics: Methods, Challenges, and Potential," Annual Keck Seminar, Gulf Coast Consortium, Magnetic Resonance Radiogenomics Conference, Rice University, Houston, TX, March 31, 2017.
47. S. Napel, "Radiomics/Radiogenomics: Tools and Techniques," Imaging Network Ontario, Toronto, Ontario, March 28-29, 2018.
48. S. Napel, "Diagnostic and Predictive Radiomics: Methods, Challenges, and Outlook," University of Washington Dept. of Radiology Grand Rounds, January 11, 2019.
49. S. Napel, "Practical Radiomics and Radiogenomics Using Computational Pipelines," Society of Pediatric Radiology, San Francisco, May 3, 2019.

Books

1. Radiomics and Radiogenomics: Technical Basis and Clinical Applications, L. Xing, R. Li, S. Napel, D.L. Rubin, Editors, CRC Press, Boca Raton, Florida, 2019.

Book Chapters

2. S.G. Magistri, S.A. Napel, K.R. Peschmann, R.E. Rand, J.L. Couch, M.J. Lipton, D.P. Boyd, "Recent Technical Advances in Cine-Computed Tomography". In: New Developments in Imaging, R.Ch. Otto and C.B. Higgins, Editors, Thieme Medical Publishers, Inc., 1986.
3. S. Napel, "Image Reconstruction." In: CT and US Technology and Applications, 1995 AAPM Summer School Proceedings. American Association of Physicists in Medicine Summer School, L.W. Goldman and J.B. Fowlkes Editors, Advanced Medical Publishing, Madison, WI, pp. 311-327, 1995.
4. S. Napel, "Image Processing and 3D Displays." In: CT and US Technology and Applications, 1995 AAPM Summer School Proceedings. American Association of Physicists in Medicine Summer School, L.W. Goldman and J.B. Fowlkes Editors, Advanced Medical Publishing, Madison, WI, pp. 603-626.
5. S. Napel, "Basic Principles of Spiral CT." In: Spiral CT (2nd Edition), E.K. Fishman and R.B. Jeffrey, Jr., Editors, Lippincott-Raven Publishers, Philadelphia, PA, pp. 3-15, 1998.

6. S. Napel, "Principles and Techniques of 3D Spiral CT Angiography." In: Spiral CT (2nd Edition), E.K. Fishman and R.B. Jeffrey, Jr., Editors, Lippincott-Raven Publishers, Philadelphia, PA, pp. 339-360, 1998.
7. C.F. Beaulieu, D.S. Paik, S. Napel, R.B. Jeffrey Jr., "Advanced 3D Display Methods," In: Atlas of Virtual Colonoscopy, A.H. Dachman, Ed., Springer Verlag Publishers, NY, pp. 37-44, 2003.
8. S. Napel, "Basic Principles of MDCT," In: Multidetector CT, Principles, Techniques, and Clinical Applications, E. Fishman and R.B. Jeffrey Jr., Eds., Lippincott Williams and Wilkins, Philadelphia, PA, pp. 3-13, 2004.
9. C.F. Beaulieu, D.S. Paik, S. Napel, R.B. Jeffrey Jr., "Advanced 3D Display Methods," In: Fundamentals of Virtual Colonoscopy, A.H. Dachman, Ed., Springer Verlag Publishers, NY, pp. 53-64, 2005.
10. S. Napel, "Principles and Rationale of Radiomics and Radiogenomics, In: , L. Xing, R. Li, S. Napel, D.L. Rubin, CRC Press, Boca Raton, Florida, pp. 3-12, 2019.