I attended the 2018 RSNA Education Council meeting and shared reflections from AAPM on our priorities in education.

See the appendix for the formal written report that I filed with RSNA prior to the meeting.

**Broad topics discussed at the meeting**

1. Update from the executive director on member statistics.
2. Update from the Board of Directors of RSNA on priorities related to education.
3. Proposals for new ideas pertaining to education at the annual meeting.
4. Annual meeting education programming.
5. Discussion of 3D surface reconstructions or 3D printing in talks and presentations and the requirements from HIPAA to mask the identity of the patient.
6. Discussion of a number of informatics based classes and hands-on activities at the annual meeting.
7. Presentation by AAPM (see my comments below).
8. Discussion of Radiographics journal.
10. Decision to add new content codes for fluoro and machine learning.
11. Discussion of adding medical physics to the list of educational objectives. They will discuss how to word those objectives and will contact AAPM as needed.

**Summary of my verbal comments on behalf of AAPM**

1. We very much appreciate the great relationship AAPM has with RSNA. This is a very significant relationship to us that has gone on for many years and we are very grateful for the wonderful way in which our two organizations partner and collaborate on a number of important initiatives related to imaging.

2. In terms of our collaborations related to educational matters, there are three items that I would like to mention briefly.
   a. AAPM members provide a number of physics courses during the RSNA meeting. I have listed these in the AAPM Liaison report. These are generally of very high quality and provide important scientific content to meeting attendees, both physicists and radiologists.
   b. The RSNA/AAPM online educational modules. These provide online educational content for use by both radiologists and physicists and are again, generally of very high quality. They are particularly useful in the education of radiology residents. These modules have been revised and updated, which is a joint effort of RSNA and AAPM.
c. There was support by RSNA 5 years ago to enable us to start 8 new imaging residencies. These residencies were jointly funded by RSNA and AAPM and have resulted in 8 CAMPEP-accredited residency programs in imaging physics. More about residency slots in a minute.

3. In terms of educational themes that are important to both AAPM and RSNA, let me give you an idea of my three top priorities for the EC of AAPM. Our top three goals are:
   a. To evaluate the balance of educational program output (number of graduate students and residents) versus the workforce needs. There has anecdotally been the opinion expressed by some that we are producing more graduate students than can be supported by the marketplace. This has some reality in that not all graduates get residencies, but this is a bit misleading in that not all physicists in medicine work in clinical practice. We are trying to emphasize with our students career options available to them including doing academic research to push the frontiers of medicine, work in industry, and work in government, such as at the FDA. We are forming a task group to collect more reliable data on the workforce issue.
   b. Second, is to understand if additional residencies still need to be created. We currently have 53 accredited graduate programs; 121 accredited residency programs, with an average of about 1.5 resident slots per year per program; and 4 DMP programs. This compares very well to the roughly 175 that we initially estimated 10 years ago would be needed. However, a problem is that the vast majority of these are in radiation oncology; we have on 22 accredited programs in imaging physics, and in 2016 (the last year with full survey data) those programs had 18 new residents enrolled, though we might expect that number to grow in the next few years to about 30 imaging residency slots per year. We hear from individuals that they have a hard time finding credentialed and certified diagnostic physicists to hire, so our sense is that there is an undersupply of qualified imaging physicists. This is likely to become worse as a large number of imaging physicists are over the age of 55. Therefore, we feel that it is important to increase the number of imaging physics residencies or else we face a significant shortage in the coming years. The AAPM board has taken the step to designate $70,000 of funding per year to establish 2 new imaging or nuclear medicine residency slots for 2 years, with the idea that this funding will be given to programs to develop sustainable programs that will live beyond the funding period. We see this as the first step in increasing the number of such residency slots. We sent to the RSNA board in February of this year a letter requesting that RSNA consider joining us in this endeavor by providing matching funding. In particular we proposed to the RSNA board that RSNA collaborate with AAPM to share costs to establish 12 new imaging physics residency positions between 2019-2026, with 50% funding coming from recipient institutions. We hope the RSNA board will respond
favorably. We would really like to see the number of imaging physicists increase across the country.

c. Third is to position education to address changes in the direction of physics in medicine. As medicine matures, and we expect more molecular therapeutics and diagnostics, the role that physicists may play in developing medicine of the future is likely to be different that it is today. We need to be determining what role physics should play in medicine in the next 30 or 40 years. This is an important initiative of AAPM. There will be educational implications from these new directions in medicine, and we need to know how to plan so that we can produce the scientists needed to advance the field and the physicist practitioners to implement that.

4. This brings me to a comment on the balance of science versus professional practice. The field of medical physics has undergone a significant professionalization in the past 20 years. This was largely driven by the requirement of the ABMS that we develop a standardized residency practice to accompany our board certifications by the ABR. As a result, we have developed a number of new residencies and so our new graduates receive a level of clinical training that is much more consistent that is was a few years ago. However, we need to be sure that we do not diminish our role as scientists that will move forward innovations in medicine. I’m afraid that some of the emphasis on professionalization has caused a diminished view of the role we play in science, but there are some of us at the highest levels of AAPM pushing back against that. This will involve active work in identifying the role that physics can play in developing and accelerating quantitative, biomarker based medicine of the future. We also have developed a new educational and professional approach called MP 3.0 to train new physicists how to offer better value as part of the team in a radiology department, including providing quantitative and scientific approaches to improving image quality and diagnostic performance.

5. I want to again thank RSNA for the great cooperation we have had in educational and scientific ventures in the past, and we look forward to that continuing. I would be happy to answer any questions.
Report to RSNA Education Council
March 21, 2018

James T. Dobbins III, PhD
Chair, AAPM Education Council

RSNA AAPM Educational 2017 Activities: 2017 RSNA Program

AAPM Medical Physics Tutorial Session 1 (Organizer: Thaddeus A. Wilson, PhD)
Digital Breast Tomosynthesis, Andrew D. Maidment, PhD
CT Breast Imaging, John M. Boone, PhD
TMIST Update, Martin J. Yaffe, PhD
Stereotactic Breast Biopsy, Ingrid Reiser, PhD

AAPM Medical Physics Tutorial Session 2 (Organizer: Thaddeus A. Wilson, PhD)
Ultrasound Breast Imaging, Wendie A. Berg, MD, PhD
MRI Breast Imaging, Donna M. Reeve, MS
Contrast Enhanced Mammography, John M. Lewin, MD
Molecular Breast Imaging, Michael K. O’Connor, PhD

AAPM/RSNA Basic Physics Lecture for the RT: Standardizing Image Quality in Digital Radiography (Organizer: Scott J. Emerson, MS)
Presenter: Alisa Walz-Flannigan, PhD

Physics Symposium: Proton (Organizer: Holly Lincoln)
Introduction: History & Advances in Proton Therapy, Indra J. Das, PhD
Proton Therapy: Promises, Principles, and Proof, Nancy P. Mendenhall, MD
Miniaturization Technology and Proton Machines, Vladimir Derenchuk, MSc
Advances in TPS and Optimization, Tony Lomax
Pencil Beam Scanning, Ronald X. Zhu, PhD
Administrative Hurdles of Setting Up Proton Beam, Anita Mahajan, MD
Proton Therapy for Ocular Cancers, Alexei V. Trofimov, PhD
Proton Imaging: Advances, Promises and Peril, Katia Parodi
Motion Management in Particle Therapy, Shinichiro Mori
Neutrons in Proton Beam, Chee-Wai Cheng

Case of the Day: Physics (David Gaunt, PhD)

PHYSICS TRACKS

TRACK 21
Coordinators: Ehsan Samei, Ph.D. and Norbert J. Pelc, DSc.
Advances in CT: Technologies, Applications, Operations—CT System Advances
Closed Gantry Systems: Advances in X-ray Sources and Detectors, Norbert J. Pelc, ScD
Open Gantry Systems: Advances, Challenges, and New Applications, Jeffrey H. Siewerdsen, PhD
Novel CT Acquisition Techniques, Lifeng Yu, PhD

Advances in CT: Technologies, Applications, Operations—Spectral CT
Data Acquisition and Image Formation Methods for Multi-Energy CT, Cynthia H. McCollough, PhD
Applications, Sebastian T. Schindera, MD
Future Prospects—Photon Counting, Taly G. Schmidt, PhD

Advances in CT: Technologies, Applications, Operations—Functional CT
Contrast Administration for Cardiovascular Imaging and Beyond, Dominik Fleischmann, MD
Perfusion Techniques and Applications—Stroke and Cancer, Ting-Yim Lee, MSc, PhD
Perfusion Techniques and Applications—Cardiac, Aaron So, PhD

Advances in CT: Technologies, Applications, Operations—CT Operation
Statistical and Iterative Reconstruction and Image Domain Denoising, Norbert J. Pelc, ScD
Protocol Optimization and Management, Mannudeep K. Kalra, MD
Dose Monitoring and Analytics, Joshua Wilson, PhD and Ehsan Samei, PhD

Advances in CT: Technologies, Applications, Operations—Special Purpose CT
Breast, John M. Boone, PhD
MSK, Wojciech Zbijewski, PhD
Interventional, Charles M. Strother, MD

Advances in CT: Technologies, Applications, Operations—CT Performance
Dose and Risk Characterization, Ehsan Samei, PhD
Image Quality Estimation, Guang-Hong Chen, PhD
Performance Evaluation, TG233, Ehsan Samei, PhD

Advances in CT: Technologies, Applications, Operations—Quantitative CT (QIBA)
Volumetry, Michael F. McNitt-Gray, PhD
Material Identification, Daniele Marin, MD
Texture Characterization, Samuel G. Armato III, PhD | Maryellen L. Giger, PhD

TRACK 22
Director: Kristy Brock

Imaging for Personalized Medicine: Head and Neck (Moderator: Robert Jeraj)
Anatomical Imaging for Personalized Medicine in the Head and Neck, Emilie Soisson, PhD
Functional Imaging for Targeting and Adaptation in the Head and Neck, Robert Jeraj

**Imaging for Personalized Medicine: Thorax** (Moderator: Martha M. Matuszak, PhD)
Anatomical Imaging for Personalized Medicine in the Thorax, Geoffrey Hugo, PhD
Functional Imaging for Targeting and Adaptation in the Thorax, Martha M. Matuszak, PhD

**MRI: Imaging for Radiation Treatment Planning** (Moderator: Eric Paulson)
MRI for Anatomical Definition, Eric Paulson
MRI for Functional Definition, Uulke A. van der Heide, PhD

**Imaging for Personalized Medicine: Abdomen** (Moderator: Kristy K. Brock, PhD)
Anatomical Imaging for Personalized Medicine in the Abdomen, Kristy K. Brock, PhD
Functional Imaging for Personalized Medicine in the Abdomen, Laura A. Dawson, MD

**MRI: Imaging for Radiation Treatment Guidance and Verification**
(Moderator: John E. Bayouth, PhD)
In-Room MRI for Treatment Guidance, John E. Bayouth, PhD
Integrating MRI: The Clinician Perspective, Caroline Chung, MD, FRCPC

**Imaging for Proton Treatment Planning** (Moderator: Jon J. Kruse, PhD)
Uncertainties in Imaging for Proton Therapy Dose Calculations, Andrew Wroe, PhD
Uncertainties in Motion for Treatment Planning, Heng Li

**Imaging for Proton Treatment Guidance and Verification** (Moderator: Jon J. Kruse, PhD)
Pre- and Intra-treatment Imaging Strategies for Patient Alignment, Jon J. Kruse, PhD
Advanced Imaging Techniques for Range Verification, Brian A. Winey, PhD, MS

**TRACK 23**
Organizer: James Kofler, PhD

**Molecular Imaging Mini-Course: Basics of Molecular Imaging**
Developing Molecular Imaging Agents, Martin G. Pomper, MD, PhD
Instrumentation (PET and CT) and Image Reconstruction, John Sunderland, PhD
Basic Clinical Applications, Hubert J. Vesselle, MD, PhD

**Update on the Maintenance of Certification Program (MOC) for ABR Medical Physics Diplomates** (Director: G. Donald Frey, PhD)
Speakers: G. Donald Frey, PhD, J. Anthony Seibert, PhD, Matthew B. Podgorsak, PhD

**MR Safety**
Case Review of Real MR Safety Incidents, Armen Kocharian, PhD
MRI Safety of Deep Brain and Other Simulators, Yunhong Shu, PhD
MRI Conditional Pacemakers: What to Do?, Anshuman Panda, PhD
MRI Safety in the MR-Guided Interventional Environment, Krzysztof Gorny, PhD
Molecular Imaging Mini-Course: Advanced Molecular Imaging
Novel Tracers, Timothy R. DeGrado, PhD
Novel Instrumentation (PET/MR), Ciprian Catana, MD, PhD
Molecular Imaging with MR, Peter D. Caravan, PhD

Clinical Applications of Molecular Imaging: Neuro MRS and PET
Oncology Applications, Hyunsuk Shim, PhD
Functional Applications, Satoshi Minoshima, MD, PhD

Evolving Perspectives on Ultrasound Safety (new for 2017, first run)
(Director: J. Brian Fowlkes, PhD)
Ultrasound Safety: Understanding the Potential Bioeffects, J. Brian Fowlkes, PhD
Ultrasound Safety: What You Should Tell the Clinicians, Jacques S. Abramowicz, MD
Diagnostic Ultrasound Regulation: Substantial Equivalence, Novel Technologies, and Reasonable Assurance of Safety and Effectiveness, Shahram Vaezy, PhD

Molecular Imaging Mini-Course: Clinical Applications of Molecular Imaging—Oncology
Diagnosis, Terence Z. Wong, MD, PhD
Staging, Dominique Delbeke, MD, PhD
Evaluation of Treatment, David A. Mankoff, MD, PhD

TRACK 25
Organizer: Michael F. McNitt-Gray, PhD

Radiomics Mini-Course: Promise and Challenges (Moderators: Sandy Napel, PhD and Michael F. McNitt-Gray, PhD)
An Overview of Radiomics, Maryellen L. Giger, PhD
From Radiomics to Radiogenomics, Hugo Aerts, PhD
Challenges for Radiomics and Radiogenomics, Karen Drukker, PhD

Radiomics: Mini-Course: Oncologic Applications (Moderators: Sandy Napel, PhD and Michael F. McNitt-Gray, PhD)
Breast Cancer with PET-CT, Richard L. Wahl, MD
Radiogenomics of Lung Cancer, Neema Jamshidi, MD, PhD
Brain Cancer: Radiomics, Radiogenomics, and Big Data, Rivka R. Colen, MD

Radiomics Mini-Course: From Image to Omics (Moderators: Sandy Napel, PhD and Michael F. McNitt-Gray, PhD)
Image Annotation and Semantic Labeling, Daniel L. Rubin, MD, MS
Image Feature Computation and Considerations, Sandy Napel, PhD
Correlating Image Features with Multi-Omics Data, Olivier Gevaert, PhD

Radiomics Mini-Course: Informatics Tools and Databases (Moderators: Sandy Napel, PhD and Michael F. McNitt-Gray, PhD)
The Role of Challenges and Their Requirements, Jayashree Kalpathy-Cramer, MS, PhD
Quantitative Image Analysis Tools: Communicating Quantitative Image Analysis Results, Andriy Fedorov, PhD
Public Databases for Radiomics Research: Current Status and Future Directions, Justin Kirby

**Quantitative Imaging Mini-Course: Promise and Challenges** (Moderator: Michael F. McNitt-Gray, PhD)
The Perspective of the RSNA Quantitative Imaging Biomarkers Alliance (QIBA), Edward F. Jackson, PhD
NCI’s Quantitative Imaging Network (QIN) Perspective, Robert J. Nordstrom, PhD
Clinical Trials Perspective, Lawrence H. Schwartz, MD

**Quantitative Imaging Mini-Course: Image Modality Specific Issues** (Moderator: Michael F. McNitt-Gray, PhD)
Quantitative Imaging for Computed Tomography: Applications and Future Directions, Samuel G. Armato III, PhD
Quantitative Imaging for PET-CT: Applications and Future Directions, Robert Jeraj
Quantitative Imaging for DCE-MRI: Applications and Future Directions, Yue Cao, PhD

**Quantitative Imaging Mini-Course: Modality Independent Issues** (Moderator: Michael F. McNitt-Gray, PhD)
The Role of Physical Phantoms in Quantitative Imaging, Paul E. Kinahan, PhD
Digital Reference Objects, Daniel P. Barboriak, MD
CT Image Analysis and Sources of Variation, Binsheng Zhao, DSc

**Quantitative Imaging Mini-Course: Statistical Analysis/Metrology Issues**
(Moderator: Michael F. McNitt-Gray, PhD)
The Role of Metrology in Quantitative Imaging, Hyung J. Kim, PhD
Methods for Technical Performance Assessment: What to Assess and How, Nicholas Petrick, PhD
Statistical Methods and Principles for Algorithm Comparison Assessment, Gene Pennello, PhD
RSNA AAPM Educational 2018 Activities: 2018 RSNA Program

**AAPM/RSNA Medical Physics Tutorial Session 1** (Organizer: Thaddeus A. Wilson, PhD)
PET/CT Introduction and Clinical Applications, Osama R. Mawlawi, PhD
PET/MR Introduction and Clinical Applications, Robert A. Pooley, PhD
Quantitative SPECT, Benjamin M. Tsui, PhD

**AAPM/RSNA Medical Physics Tutorial Session 2** (Organizer: Thaddeus A. Wilson, PhD)
The Nuts and Bolts of Dosimetry in Medicine and its Application, Michael G. Stabin, PhD
Theranostics Introduction and Applications, Hossein Jadvar, MD, PhD

**AAPM/RSNA Basic Physics Lecture for the RT**
(Organizer: Scott J. Emerson, MS)
Basic Dual Energy CT Applications in Radiation Therapy, Jessica Miller, PhD

**Physics Symposium: Highlights of Medical Physics Leadership Academy (MPLA) Summer School** (Organizer: Holly Lincoln)
Jennifer Lynn Johnson, PHD
Daniel Pavord, MS
Robert J. Pizzutiello JR, MS
Michael Howard, PHD

**Case of the Day: Physics** (Karen Brown)

**PHYSICS TRACKS**

**TRACK 21**

**RC121 Advances in CT: Technologies, Applications, Operations-Quantitative CT (QIBA)**
Coordinators: Ehsan Samei, Ph.D. and Lifeng Yu, Ph.D.
Volumetry, Michael F. McNitt-Gray, PhD
Material Identification, Daniele Marin, MD
Texture Characterization, Samuel G. Armato III, PhD
Texture Characterization, Maryellen L. Giger, PhD

**RC221 Advances in CT: Technologies, Applications, Operations-Special Purpose CT**
Coordinators: Ehsan Samei, Ph.D. and Lifeng Yu, Ph.D.
Breast CT applications, John M. Boone, PhD
MSK CT applications, Wojciech Zbijewski, PhD
Interventional CT applications, Tobias Struffert

**RC321 Advances in CT: Technologies, Applications, Operations-Spectral CT**
Coordinators: Ehsan Samei, Ph.D. and Lifeng Yu, Ph.D.
Data Acquisition and Rendition Methods, Cynthia H. McCollough, PhD
Applications, Sebastian T. Schinderer, MD
Future Prospects - Photon Counting, Taly G. Schmidt, PhD

**RC421 Advances in CT: Technologies, Applications, Operations-Functional CT**
Coordinators: Ehsan Samei, Ph.D. and Lifeng Yu, Ph.D.
Contrast Administration for Cardiovascular Imaging and Beyond, Dominik Fleischmann, MD
Perfusion Techniques and Applications - Stroke and Cancer, Ting-Yim Lee, MSc, PhD
Perfusion Techniques and Applications - Cardiac, Aaron So, PhD

**RC521 Advances in CT: Technologies, Applications, Operations-CT Performance**
Coordinators: Ehsan Samei, Ph.D. and Lifeng Yu, Ph.D.
Image Quality Characterization, Guang-Hong Chen, PhD
Performance Evaluation, Yakun Zhang, PhD
Performance Evaluation, Ehsan Samei, PhD
Performance Optimization, Justin Solomon, PhD
Performance Optimization, Ehsan Samei, PhD

**RC621 Advances in CT: Technologies, Applications, Operations-CT Practice**
Coordinators: Ehsan Samei, Ph.D. and Lifeng Yu, Ph.D.
Practice management, Tim Szczykutowicz, PhD
Practice optimization, Mannudeep K. Kalra, MD
Practice monitoring, Joshua Wilson, PhD
Practice monitoring, Ehsan Samei, PhD

**RC721 Advances in CT: Technologies, Applications, Operations-CT Systems**
Coordinators: Ehsan Samei, Ph.D. and Lifeng Yu, Ph.D.
MDCT systems and acquisitions, Lifeng Yu, PhD
Cone-beam systems and acquisitions, Jeffrey H. Siewerdsen, PhD
Statistical and iterative reconstruction, Frederic Noo, PhD

**TRACK 22**
Director: Kristy Brock

**RC122 Anatomical MR Imaging for Radiotherapy Planning and Guidance**
State of the Art in Anatomical MR imaging, Aradhana M Venkatesan
Clinical need for Anatomical MR imaging in Radiation Therapy, Cynthia Ménard
Technical Challenges in the Integration of Anatomical MR Imaging into Radiotherapy, Carri Glide-Hurst

**RC222 Functional MR Imaging for Tumor Targeting in Radiotherapy**
State of the Art in Functional MR imaging for Tumor Targeting, Jason Stafford
Clinical need for Functional MR imaging for Tumor Targeting in Radiation Therapy,
Technical Challenges in the Integration of Functional MR Imaging for Tumor Targeting into Radiotherapy
RC322 Functional MR Imaging for Normal Tissue Response Assessment in Radiotherapy
State of the Art in Functional MR imaging for Normal Tissue Assessment, Clinical need for Functional MR imaging for Normal Tissue Assessment in Radiation Therapy, Clifton David Fuller
Technical Challenges in the Integration of Functional MR Imaging for Normal Tissue Assessment into Radiotherapy

RC422 Dual Energy CT for Radiotherapy Applications
State of the Art in Dual Energy CT Technology, Kruse, Jon J., Ph.D.
Clinical Need for Dual Energy CT in Proton Radiotherapy, Jessica Miller, Ph.D.
Technical Challenges in the Integration of Dual Energy CT into Radiotherapy Treatment Planning, Kruse, Jon J., Ph.D.

RC522 Advanced PET Imaging for Radiotherapy Planning and Response Assessment
State of the Art in PET Imaging, Paul Kinahan
Clinical Need for PET imaging in Radiotherapy
Technical Challenges in the Integration of PET imaging into Radiotherapy Treatment Planning, Steven Bowen

RC622 Advances in CBCT Acquisition and Reconstruction in Radiotherapy
State of the Art in Advanced CBCT Acquisition and Reconstruction
Clinical Need for advanced CBCT imaging in Radiotherapy, Tianyu Zhao
Technical Challenges in the Integration of CBCT imaging into Radiotherapy, Doug Moseley

RC722 Machine Learning for Radiotherapy Applications
Deep Learning for Image Segmentation, Analysis and Reconstruction, Jonas Teuwen
Machine Learning tumor classification, Jayashree Kalpahy-Cramer
Machine Learning for Automated treatment planning, Laurence Court

TRACK 23

RC123 ACR Accreditation Updates I
Coordinator: James M. Kofler, PhD
ACR CT Accreditation Update, Chad Dillion, PhD
ACR MRI Accreditation Update, Donna Reeve, PhD
ACR Nuclear Medicine and PET Accreditation Update, Beth Harkness
ACR Accreditation Updates II, James M. Kofler, PhD

RC223A ACR Breast X-Ray Imaging Accreditation Update, Eric Berns
Coordinator: James M. Kofler, PhD
ACR US Accreditation Update, Zhengfeng Lu, Ph.D.
ACR Accreditation: Preparing for a Site Visit, Heidi Edmonson, PhD

RC323 Evolving Perspectives on Ultrasound Safety
Coordinator: J. Brian Fowlkes, PhD
Ultrasound Safety: Understanding the Potential Bioeffects, J. Brian Fowlkes, PhD
Ultrasound Safety: What the clinician should know, Jacques S. Abramowicz, MD
Ultrasound safety-What you should know about therapeutic ultrasound, Ken Bader, PhD

RC423 Making Patients and Staff Safer in Interventional Procedures
Coordinators: William F. Sensakovic, PhD and Thaddeus A Wilson, Ph.D.
Patient Doses (in lab) and patient dose management, Steve Balter, PhD
Staff Protection- Cataract and potential cancers, Madan Rehani, PhD
Dose tracking and audits- Institution-wide program, Pei-Jan Lin PhD

RC523 Optimization and Technology in Interventional Radiology
Coordinators: William F. Sensakovic, PhD and Thaddeus A Wilson, Ph.D.
Dose Optimization in the Interventional Suite, Robert G. Dixon, PhD
Using Ultrasound in Place of CT and Fluoroscopy in the Interventional Suite, Patrick Warren, MD
Advances in Interventional Use of CT, Chuck Mistretta, PhD

RC623 Advanced Ultrasound Technology and Applications
Coordinators: William F. Sensakovic, PhD and Thaddeus A Wilson, Ph.D.
Contrast Agents, Peter Burns, PhD
Strain Imaging, Steve McAleavey, PhD
Practical Clinical Advice on the use of Contrast and Strain Imaging, Richard Barr, PhD

RC723 Diagnostic Imaging: Contrast Makes all the Difference
Coordinator: Charles E. Willis, PhD
Diagnostic Imaging: Contrast Makes all the Difference: 1, Andrew D. A. Maidment, PhD
Diagnostic Imaging: Contrast Makes all the Difference: 2, J. Anthony Seibert, PhD
Diagnostic Imaging: Contrast Makes all the Difference: 3, Robert L. Dixon, PhD

RC823 CT radiation dose reduction: techniques and clinical implementation
Coordinator: Lifeng Yu, PhD
Overview of technology for radiation dose reduction, Joseph W. Stayman, PhD
Dose optimization strategy and clinical implementation in adult CT, Lifeng Yu, PhD
Dose reduction and protocol optimization in pediatric CT, Robert D. MacDougall

TRACK 25

RC125 Medical Physics 3.0: Re-envisioning Medical Physics in the Era of Value-based and Precision Healthcare
Coordinators: Todd Pawlicki, PhD and Ehsan Samei, PhD
Medical Physics 3.0: Re-envisioning Medical Physics in the Era of Value-based and Precision Healthcare, Todd Pawlicki, PhD
Medical Physics 3.0: Re-envisioning Medical Physics in the Era of Value-based and Precision Healthcare, Ehsan Samei, PhD

RC225 Mini-course: Image Interpretation Science -- Clinical Foundations of Medical Image Perception: Why Study Radiologists
Coordinators: Elizabeth Krupinski and Ehsan Samei, PhD
Clinical Relevance of Perceptual Issues in Radiology, Francine L. Jacobson, MD, MPH
A Short History of Image Perception in Radiology, Elizabeth A. Krupinski, PhD

**RC325 Mini-course: Image Interpretation Science -- Radiologic Expertise: Incorporating Perception into Training**
Coordinators: Elizabeth Krupinski and Ehsan Samei, PhD
On the Development of Expertise in Image Interpretation, Elizabeth A. Krupinski, PhD
Using Expert Interpretation Strategies to Teach Trainees, William Auffermann, MD, PhD
Formal Assessment of Practicing Radiologists, Alastair G. Gale, PhD

**RC425 Mini-course: Image Interpretation Science -- Computational Perception**
Coordinators: Elizabeth Krupinski and Ehsan Samei, PhD
AI in Clinical Radiology, Maryellen L. Giger, PhD
Intersection of Imaging Informatics and Perception, Katherine P. Andriole, PhD
Radiologist Interpretation in the Era of AI, Curt Langlotz

**RC525 Mini-course: Image Interpretation Science -- Perception in the Clinic**
Coordinators: Elizabeth Krupinski and Ehsan Samei, PhD
Impact of Fatigue on Radiologists' Performance, Elizabeth A. Krupinski, PhD
Perception of Volumetric Image Data, Geoffrey D. Rubin, MD
Role of Image Quality in Visual and Computational Perception, Justin B. Solomon, PhD
Role of Image Quality in Visual and Computational Perception, Ehsan Samei, PhD

**RC625 Mini-course: Radiation safety for patients and staff -- Emerging advances in patient radiation protection**
Coordinator: Madan M. Rehani, PhD
Emerging concepts of integration of image quality, radiation dose, and artificial intelligence, Ehsan Samei, PhD
Practical aspects of integration of clinical image quality and patient dose optimization, Madan M. Rehani, PhD

**RC725 Mini-course: Radiation safety for patients and staff -- Practice tools and approaches for radiation safety**
Coordinator: Madan M. Rehani, PhD
Decision support systems as effective tools, James A. Brink, MD
Safety in CT of children, Donald P. Frush, MD
Safety in nuclear medical procedures, Andrew J. Einstein, MD, PhD
Safety in interventional fluoroscopic procedures, Donald Miller, PhD