David J. Carlson, PhD, FASTRO, FAAPM
Professor, Vice Chair & Director of Medical Physics
Yale University School of Medicine
Dept. of Therapeutic Radiology
Yale New Haven Health
Dept. of Radiation Oncology
New Haven, CT 06510
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Education

Stanford University, Residency, Radiation Oncology Physics: 2006–2008
Clinical training in a CAMPEP-accredited Radiation Oncology Physics residency program

Purdue University, Ph.D., Medical Physics: 2002–2006
Degree: Medical Physics, Concentration: Radiation Oncology Physics; Dissertation: Mechanisms of intrinsic radiation sensitivity: the effects of DNA damage repair, oxygen, and radiation quality.

Middlebury College, B.A., Physics: 1998–2002
Major: Physics, Minor: French; Thesis: Design and construction of a fiber optic acquisition module for use in stellar spectroscopy.

School for International Training, Madagascar: 2000
Cultural and language immersion program with a focus on Ecology, Conservation, and French language
Thesis: Comparison of traditional and modern medicine in rural Ifotaka, Madagascar.

Experience

Yale University School of Medicine, Department of Therapeutic Radiology, Professor, Vice Chair & Director of Medical Physics: 2022–present

Yale-New Haven Health, Dept. of Radiation Oncology, Director of Medical Physics: 2022–present

University of Pennsylvania, Radiation Oncology, Director of Physics Operations: 2019–2022
Direct all clinical radiation oncology physics activities at Perelman Center for Advanced Medicine and across the Penn Medicine network, Supervisor: Lei Dong, Ph.D. (Lei.Dong@pennmedicine.upenn.edu)

Yale-New Haven Hospital, Radiation Oncology, Medical Physicist: 2008–2019
Radiation oncology physicist, Supervisor: Ravinder Nath, Ph.D. (ravinder.nath@yale.edu)

Stanford University, Radiation Oncology, Medical Physics Resident: 2006–2008
Clinical training in a CAMPEP-accredited Radiation Oncology Physics residency program
Program director: Gary Luxton, Ph.D. (gluxton@stanford.edu)

Purdue University, School of Health Sciences, Research Assistant: 2004–2006
Research in radiobiological modeling and biological optimization of radiation therapy
Supervisor: Robert D. Stewart, Ph.D. (trawets@uw.edu)

Medical College of Wisconsin, Radiation Oncology, Clinical Physics Intern: 2004
Clinical training in radiation oncology physics, research in biological optimization of radiation therapy
Supervisor: X. Allen Li, Ph.D. (ali@radonc.mcw.edu)

Faculty Appointments

Yale University, Department of Therapeutic Radiology, Professor: 2022–present
University of Pennsylvania, Department of Radiation Oncology, Associate Professor: 2019–2022
Yale University, Department of Therapeutic Radiology, Associate Professor: 2014–2019
Yale University, Department of Therapeutic Radiology, Assistant Professor: 2008–2014

Professional Affiliations

American Association of Physicists in Medicine (AAPM): 2002–present

American Society for Radiation Oncology (ASTRO): 2006–present

Radiation Research Society (RRS): 2002–present

Yale Cancer Center (YCC): 2011–2019, 2022–present

Particle Therapy Co-Operative Group (PTCOG): 2017–present

Professional Service

Editorial Board of the ***International Journal of Radiation Oncology, Biology, and Physics***

Deputy Editor & Section Editor, Physics (2024–present)
Executive Editor & Section Editor, Physics (2021–2024)
Senior Editor, Physics (2019–2021)
Associate Senior Editor, Physics (2016–2019)

American Board of Radiology (ABR)

Medical Physics Clinical Exam Committee, Chair (2024–present), Associate Chair (2023), Member (2018–present)
Medical Physics Test Assembly, Member (2023–present)

American Society for Radiation Oncology (ASTRO)

Scientific Review Panel, Member (2023–present)
Annual Meeting Track – Physics, Member (2013–2014, 2017–2019, 2023–present)
Science Education and Program Development Subcommittee, Past Chair (2023–present), Chair (2020–2022), Vice-Chair (2018–2019), Member (2013–present)
Science Council Steering Committee, Member (2018–present)
ASTRO Career Mentor (2022–present)
Annual Meeting Steering Committee, Member (2020–2023)
Annual Meeting Education Committee, Member (2018–present)
Promoting Science through Research and Training Committee, Member (2017–2022)
Clinical, Translational, and Basic Science Advisory Subcommittee, Member (2016–2017)
Radiation and Cancer Biology Committee, Member (2013–2014)

American Association of Physicists in Medicine (AAPM)

Particle Therapy Subcommittee (PTSC), Member (2024–present)
Molecular Imaging in Radiation Oncology Work Group, Member (2018–present)
Work Group on Particle Beams (WGPB), Member (2021–2024)

Program Director for Therapy Education for the Annual Meeting of the AAPM (2020)
Program Co-Director for Therapy Education for the Annual Meeting of the AAPM (2019)
Annual Meeting Education Program Working Group, Member (2018–2020)
Audit Committee, Member (2018–2019)
Board of Directors, Member (2015–2017)
Regional Organization Committee, Member (2015–2017)
Task Group No. 256 on Proton Relative Biological Effectiveness, Member (2013–2016)
Professional Development Needs Assessment Subcommittee, Member (2012–2014)
International Educational Activities Committee, Member (2012–2014)
International Affairs Committee, Member (2011–2014)
African Affairs Subcommittee, Vice-Chair (2011–2016), Member (2007–2016)
Delaware Valley Chapter of AAPM, Nominating Committee (2019–2020)
Connecticut Area Medical Physics Society (CAMPS) chapter of AAPM, President-Elect (2011), President (2012), Past-President (2013), Chapter Representative (2015-2017)
Northern California Chapter of AAPM, President-Elect (2007), President (2008), Past-President (2009)

Radiobiology Subcommittee of the **Particle Therapy Co-Operative Group (PTCOG)**
Member (2017–present)

Co-Editor of a **Special Issue of the *International Journal of Radiation Oncology, Biology, Physics*** on "Adaptive Radiation Therapy" (2025)

Moderator of a **Scientific Session** on "Physics – Treatment Technology" at the 66th Annual Meeting of ASTRO in Washington, DC, October 1 (2024)

Session Organizer and **Moderator** of a **Scientific Panel** on "Recent Advances in the Physics of FLASH Radiotherapy" at the 64th Annual Meeting of ASTRO in San Antonio, TX, October 24 (2022)

Session Organizer and **Moderator** of an **Educational Session** on "Current Challenges and Prospects in Motion Management for Radiotherapy" at the 64th Annual Meeting of the AAPM in Washington, DC, July 11 (2022)

Moderator of a **Scientific Session** on "Radiobiological Modeling and Biologically Guided RT" at the 64th Annual Meeting of the AAPM in Washington, DC, July 10 (2022)

Co-Organizer of the **Medical Applications in the Accelerator Applications** track at the 26th International Conference on the Application of Accelerators in Research and Industry (CAARI) and 53rd Symposium of Northeastern Accelerator Personnel (SNEAP) in Denton, TX, October 30-November 3, (2022)

Co-Editor of a **Special Issue of *Medical Physics*** on "FLASH radiotherapy: Current Status and Future Developments" (2021)

Session Organizer and **Moderator** of a **Scientific Panel** on "Recent Developments in the Prediction of Clinical Outcomes Data in Radiation Oncology" at the 63rd Annual Meeting of ASTRO in Chicago, IL, October 26 (2021)

Session Organizer and **Moderator** of a **Scientific Panel** on the "Clinical Translation of FLASH Radiotherapy" at the 63rd Annual Meeting of ASTRO in Chicago, IL, October 26 (2021)

Session Organizer and **Moderator** of a **Scientific Panel** on "Advances in Image-Guided Adaptive Radiotherapy" at the 63rd Annual Meeting of ASTRO in Chicago, IL, October 27 (2021)

Session Organizer and **Moderator** of a **Scientific Panel** on the "The Physics of FLASH Radiotherapy" at the 62nd Annual Meeting of ASTRO, Miami, FL (Virtual), October 28 (2020)

Session Organizer and **Moderator** of an **Educational Session** on "The Radiation Biology of Heavy Ion Radiation Therapy" at the 62nd Annual Meeting of ASTRO, Miami, FL (Virtual), October 28 (2020)

Session Organizer and **Moderator** of an **Educational Session** on the "Mechanisms and Clinical Significance of Particle RBE" at the Joint AAPM/COMP Annual Meeting, Vancouver, Canada (Virtual), July 14 (2020)

Session Organizer and **Moderator** of an **Educational Session** on "Clinical Outcomes Modeling" at the Joint AAPM/COMP Annual Meeting, Vancouver, Canada (Virtual), July 12 (2020)

Session Organizer and **Moderator** of a **Scientific Panel** on "FLASH therapy with protons – dosimetry, safety, and experimental evidence" at the 61st Annual Meeting of ASTRO in Chicago, IL, September 16 (2019)

Session Organizer and **Moderator** of a **Scientific Panel** on "Functional Imaging for Biologically-Guided Adaptive Radiotherapy" at the 61st Annual Meeting of ASTRO in Chicago, IL, September 15 (2019)

Featured Panelist for a **Meet the Expert session (Physics)** at the 61st Annual Meeting of ASTRO in Chicago, IL, September 16 (2019)

Moderator of a **Scientific Session** on "Physics – Outcome Analysis and Modeling" at the 61st Annual Meeting of ASTRO in Chicago, IL, September 16 (2019)

Session Organizer and **Moderator** of an **Educational Session** on "Current Challenges and Prospects in Particle Therapy" at the 61st Annual Meeting of the AAPM in San Antonio, TX, July 15 (2019)

Moderator of a **Scientific Session** on "Radiobiology and Radioimmunology" at the 61st Annual Meeting of the AAPM in San Antonio, TX, July 17 (2019)

Discussant for a **Scientific ePoster Session** on "Outcome Analysis and Response Imaging" at the 60th Annual Meeting of ASTRO in San Antonio, TX, October 23 (2018)

Moderator of a **Scientific Session** on "Radiobiology: Experiments and Modeling" at the 60th Annual Meeting of the AAPM in Nashville, TN, July 31 (2018)

Scientific Grant Reviewer for the **Space Radiation Cancer Panel** of the **National Aeronautics and Space Administration (NASA) Human Exploration Research Program** (2017)

External Examiner for a **Doctoral Thesis Oral Examination** in the Department of Physics at Stockholm University and the Karolinska Institute, Stockholm, Sweden, December 5 (2017)
Dr. Emely K. Lindblom: "Time, dose and fractionation: accounting for hypoxia in the search for optimal radiotherapy treatment parameters"

Session Organizer and **Moderator** of a **Scientific Symposium** on "What Is the Optimal Time Course for SBRT To Improve Outcomes: Reviewing the Evidence from Pre-Clinical, Clinical and Modeling?" at the 58th Annual Meeting of ASTRO in Boston, MA, September 27 (2016)

Discussant for a **Scientific ePoster Session** on "Physics - Outcome Analysis and Modeling" at the 58th Annual Meeting of ASTRO in Boston, MA, September 28 (2016)

Session Organizer and **Moderator** of a **Scientific Symposium** and **SAM Session** on "The Challenges of Predicting RBE Effects in Particle Therapy and Opportunities for Improving Cancer Therapy" at the 58th Annual Meeting of the AAPM in Washington, DC, August 3 (2016)

Moderator of a **Scientific Session** on "Modeling and Outcomes" at the 58th Annual Meeting of the AAPM in Washington, DC, August 3 (2016)

Scientific Advisory Committee for **NIH NCI Program Project Grant** (P01 CA190193) for Dartmouth College, Emory University, & Université Catholique de Louvain – Brussels, Member (2013–2018)

External Examiner for a **Doctoral Thesis Oral Examination** in the Department of Physics and Astronomy at the University of Calgary, Alberta, Canada, August 14 (2015)
Dr. Michael Balderson: "Modeling Tumour Control in External Beam Radiotherapy for Prostate Cancer"

Session Organizer and **Moderator** of a **Scientific Panel** on the "Radiobiology of High-Dose Stereotactic Radiotherapy" at the 56th Annual Meeting of ASTRO in San Francisco, CA, September 14 (2014)

Moderator of a **Scientific Session** on "Physics – Tumor and Normal Tissue Response Modeling" at the 56th Annual Meeting of ASTRO in San Francisco, CA, September 15 (2014)

Scientific Grant Reviewer for the **Lung Cancer Research Program** of the **Department of Defense Congressionally Directed Medical Research Programs** (2013)

Session Organizer and **Moderator** of a **Scientific Symposium** on "Biophysical Modeling for High-Dose Hypofractionated Radiotherapy" at the 54th Annual Meeting of the AAPM in Charlotte, NC, August 2 (2012)

Session Organizer and **Moderator** of a **Scientific Symposium** on "Predicting and Exploiting the Effects of Radiation Quality in Ion Therapy" at the Joint AAPM/COMP Annual Meeting in Vancouver, Canada, August 2 (2011)

Guest Associate Editor:

International Journal of Particle Therapy (2020–present)

Medical Physics (2007–present)

Peer Reviewer:

Medical Physics (2004–present), *Physics in Medicine and Biology* (2006–present)
International Journal of Radiation Oncology Biology Physics (2007–present)
Radiation Research (2007–present), *British Journal of Radiology* (2009–present)
RSNA/AAPM Online Physics Modules (2009), *Practical Radiation Oncology* (2011-present)
International Journal of Radiation Biology (2010–present), *Radiation Oncology* (2011-present)
ASTRO physics abstracts for 51st–56th and 60th–61st Annual Meetings (2009-2014, 2018-2019)
AAPM abstracts for 55th – 65th Annual Meetings (2013-2023)

Certifications and Honors

M.A. Privatim, Honorary Master's Degree (M.A.H.), Yale University: 2023

Fellow, American Society for Radiation Oncology (ASTRO): 2023

Fellow, American Association of Physicists in Medicine (AAPM): 2018

Diplomate of the American Board of Radiology (ABR) certified in **Therapeutic Radiologic Physics**: 2009–present

Invited Participant to an **International Workshop** on "Accounting for Fractionation in Radiation Therapy – Is It Time to Put the BED to Bed" at the Royal Swedish Academy of Sciences, organized by Stockholm University & Karolinska Institut (2024)

Manuscript featured as top 10 most-cited paper published in *Medical Physics* in 2022–2023: ***Med. Phys. 49: 2039–2054*****:** 2022

Invited Participant to an **International Workshop** on "The Role of Oxygen in Radiation Therapy" at the Royal Swedish Academy of Sciences, organized by Stockholm University/Karolinska Institut and the University of Heidelberg/German Cancer Research Center (DKFZ) (2023)

Host of a Podcast for the *International Journal of Radiation Oncology, Biology, Physics* on **Advances in Particle Therapy** (2023): https://www.redjournal.org/audio-do/red-journal-podcast-july-15-2023

Appointed by the **Faculty of Science** to serve as an **External Expert Referee** for an Associate professorship in Medical Radiation Physics in the Department of Physics, Stockholm University, Stockholm, Sweden (2020)

Manuscript featured as the 2nd most downloaded paper of 2014 in **"The Red Journal's Top Downloads of 2014. *Int. J. Radiat. Oncol. Biol. Phys.* 2015; 93: 4–6":** 2015

Purdue University, School of Health Sciences, "Outstanding Young Alumni" Award: 2014

Selected as an **"Outstanding Reviewer"** for the ***Int. J. Radiat. Oncol. Biol. Phys.***: 2012

Visiting Fellow, German Cancer Research Center (DKFZ), Division of Medical Physics: June 2011

Radiation Research Society, Editor's Award: 2009
Recipient of the Editors' Award for publication of an outstanding paper in *Radiation Research* in 2008

Radiation Research Society, Scholar-in-Training Travel Award: July 2007
13th International Congress of Radiation Research (ICRR), San Francisco, CA, July 8–12, 2007

Radiation Research Society, Scholar-in-Training Travel Award: November 2006
53rd Annual Meeting of the Radiation Research Society, Philadelphia, PA, Nov 5–8, 2006

Purdue University, Ross Fellowship: 2003

Purdue University, Graduate Student Travel Award: August 2003
12th International Congress of Radiation Research (ICRR), Brisbane, AUS, Aug 17–22, 2003

Research Support

Current

Project Title: Investigating the use of FDG and new PET tracers for SCINTIX
Sponsor: RefleXion Medical, Inc.
Project Period: April 1, 2024 to present
Role: PI, **Level of Funds:** $20,000

Project Title: Investigating the efficacy of SCINTIX for treating multiple tumors using a single ^{18}F-FDG injection
Sponsor: RefleXion Medical, Inc.
Project Period: April 1, 2024 to present
Role: PI, **Level of Funds:** $20,000

Project Title: Non-invasive assessment of hypoxia as a biomarker of T-cell therapy response in relapsed or refractory large B-cell lymphomas
Sponsor: American Cancer Society Institutional Research Grant
ID #: IRG-21-132-60

Project Period: January 1, 2024 to present
Role: Co-investigator (PI: Timothy Robinson, MD, PhD), **Level of Funds:** $40,000

Project Title: Single day prostate radiotherapy: Is utilization of brachytherapy the missing key?
Sponsor: Yale Cancer Center
Project Period: January 1, 2025 to present
Role: Co-investigator (PI: Christopher Tien, PhD), **Level of Funds**: $65,000

Completed

Project Title: Characterization of a novel brachytherapy applicator with dynamic shielding for radiation therapy in cervical cancer
Sponsor: American Cancer Society Institutional Research Grant
ID #: IRG-17-172-57
Project Period: February 1, 2023 to August 31, 2024
Role: Co-investigator (PI: Christopher Tien, PhD), **Level of Funds:** $40,000

Project Title: Tumor-targeted delivery and cell internalization of theranostic gadolinium nanoparticles for image-guided nanoparticle-enhanced radiation therapy
Sponsor: National Institutes of Health/National Institute of Biomedical Imaging and Bioengineering
ID #: 1R21EB026553-01A1
Project Period: September 1, 2019 to August 31, 2022
Role: Co-investigator (PI: Wu Liu, PhD), **Level of Funds:** $400,000

Project Title: Pre-clinical development of Mibefradil as a novel glioma radiosensitizer
Sponsor: American Cancer Society-Research Scholar Grant
ID #: 128352-RSG-15-197-01-TBG
Project Period: January 1, 2016 to December 31, 2019
Role: Co-investigator (PI: Ranjit Bindra, MD, PhD), **Level of Funds:** $792,000

Project Title: ViKTriY Early Clinical Trials Consortium (ECTC)
Sponsor: National Institute of Health (NIH)
ID #: 3UM1CA186689
Project Period: September 1, 2016 to February 28, 2018
Role: Co-investigator (PI: Patricia M. LoRusso, DO), **Level of Funds:** $100,000

Project Title: Comparing In Vivo biodosimetry with EPR to independent physical dosimetry methods
Sponsor: NIH/NIAID, The Dartmouth Physically-Based Biodosimetry Center for Medical Countermeasures against Radiation (Dart-Dose CMCR) Pilot Program
ID #: Pilot grant from U19AI1091173 (Swartz, H.)
Project Period: August 1, 2014 to July 31, 2016
Role: PI, **Level of Funds:** $50,000

Project Title: In vivo biodosimetry using electron paramagnetic resonance (EPR) spectroscopy
Sponsor: Biomedical Advanced Research and Development Authority (BARDA) within the Office of the Assistant Secretary for Preparedness and Response in the U.S. Dept. of Health and Human Services
ID #: Subcontract #HHSO100201100024C from Dartmouth College
Project Period: January 1, 2014 to August 31, 2015
Role: PI, **Level of Funds:** $87,827

Project Title: Non-invasive imaging of tumor hypoxia in non-small cell lung cancer (NSCLC) patients undergoing stereotactic body radiotherapy (SBRT)
Sponsor: Yale Comprehensive Cancer Center
Project Period: January 1, 2012 to August 31, 2013
Role: PI, **Level of Funds:** $25,000

Project Title: A pilot study of tumor hypoxia in non-small cell lung cancer (NSCLC) patients undergoing stereotactic body radiotherapy (SBRT)
Sponsor: Kalimeris Fund
Project Period: January 1, 2012 to December 31, 2012
Role: Co-PI, **Level of Funds:** $8,000

Project Title: Modeling relative biological effectiveness and oxygen effects in x-ray, proton, and carbon ion radiotherapy
Sponsor: American Cancer Society Institutional Research Grant
ID #: IRG-58-012-52
Project Period: April 1, 2010 to March 31, 2011
Role: PI, **Level of Funds:** $20,000

Clinical Trials

Past Clinical Trials

HIC# 1205010319
Project Title: Non-invasive imaging of tumor hypoxia in non-small cell lung cancer patients undergoing stereotactic body radiotherapy
P.I.: Roy H. Decker, M.D., Ph.D.
Role: Co-Investigator
Trial Period: January 4, 2013 to 2019
Sponsor: Yale Cancer Center Pilot Grant (PIs: Carlson and Decker)

HIC# 1401013325
Project Title: In vivo biodosimetry using electron paramagnetic resonance (EPR) spectroscopy
P.I.: Kenneth B. Roberts, M.D.
Role: Co-Investigator
Trial Period: February 21, 2014 to 2019
Sponsor: BARDA in the U.S. Dept. of Health and Human Services, Subcontract HHSO100201100024C from Dartmouth School of Medicine (PI: Carlson) and the Dart-Dose CMCR Pilot Program (PI: Carlson)

HIC# 1502015353
Project Title: Use of Radiation-induced paramagnetic centers in clipped nails to measure radiation dose after the fact
P.I.: Kenneth B. Roberts, M.D.
Role: Co-Investigator
Trial Period: July 29, 2015 to 2019
Sponsor: BARDA in the U.S. Dept. of Health and Human Services, Subcontract HHSO100201100024C from Dartmouth School of Medicine (PI: Carlson) and the Dart-Dose CMCR Pilot Program (PI: Carlson)

Publications

Journal Articles

1. Guan F, Donahue W, Biggs S, Jennings M, Draeger E, Chen H, Wang Y, Nguyen N, **Carlson DJ**, Chen Z, Han DY. 3D gamma analysis between treatment plans for nominally beam-matched medical linear accelerators using PyMedPhys. *Precision Radiation Oncology*. 8: 191–199 (2024).
2. Bertholet B, **Carlson DJ**, Aznar MC. Membership data from scientific and professional societies: An ally in the quest to improve the retention of women in medical physics and radiation oncology societies [editorial]. *Int. J. Radiation. Oncol. Biol. Phys.* 119: 1344–1346 (2024).
3. Draeger E, Roberts K, Decker RD, Bahar N, Wilson LD, Contessa J, Husain Z, Williams BB, Flood AB, Swartz HM, **Carlson DJ.** In vivo verification of electron paramagnetic resonance biodosimetry using patients undergoing radiotherapy treatment. *Int. J. Radiation. Oncol. Biol. Phys.* 119: 292–301 (2024).

4. Guan F, Zhao L, Bronk JK, Maletic-Savatic M, Grosshans D, **Carlson DJ.** Advances in the biological effects of ionizing radiation [editorial] *Frontiers in Oncology.* 13: 1352771 (2024).
5. Bertholet J, Al Hallaq H, Toma-Dasu I, Ingledew PA, **Carlson DJ.** Medical Physics training and education: learning from the past and looking to the future. [review] *Int. J. Radiation. Oncol. Biol. Phys.* 117: 1039–1044 (2023).
6. Ebrahimi B, Howard A, **Carlson DJ**, Al-Hallaq H. ChatGPT: Can a natural language processing tool be trusted for Radiation Oncology use? [editorial]. *Int. J. Radiation. Oncol. Biol. Phys.* 116: 977–983 (2023).
7. Al-Hallaq H, Castillo R, van der Horst A, Deville C, **Carlson DJ**. Perspectives on health disparities and inequities in Radiation Oncology and opportunities for medical physicists' awareness to action. [review] *Int. J. Radiation. Oncol. Biol. Phys.* 116: 6–11 (2023).
8. Zou W, Kim H, Diffenderfer E, **Carlson DJ**, Koch C, Xiao Y, Teo BK, Kim MM, Metz JM, Fan Y, Maity A, Koumenis C, Busch TM, Wiersma R, Cengel KA, Dong L. A phenomenological model of proton FLASH oxygen depletion effects depending on tissue vasculature and oxygen supply. *Front. Oncol.* 12:1004121 (2022).
9. Su W, Wright CM, Lee DY, Kim M, Anstadt EJ, Teo BK, **Carlson DJ**, Lukens JN, Eisbruch A, Lin A. Stricter postoperative oropharyngeal cancer radiotherapy normal tissue dose constraints are feasible. *Pract. Radiat. Oncol.* 12: e2821–e285 (2022).
10. Beaulieu L, Al-Hallaq H, Rosen BS, **Carlson DJ**. Multicriteria optimization in brachytherapy [review]. *Int. J. Radiation. Oncol. Biol. Phys.* 114: 177–180 (2022).
11. Yom SS, Deville C, Boerma M, **Carlson DJ**, Jabbour SK, Braverman L. Evaluating the generalizability and reproducibility of scientific research [editorial]. *Int. J. Radiation. Oncol. Biol. Phys.* 113: 1–4 (2022).
12. Diffenderfer ES, Sørensen BS, Mazal A, **Carlson DJ**. The current status of pre-clinical proton FLASH radiation and future directions. *Med. Phys.* 49: 2039–2054 (2022).
13. Farr JB, Parodi K, **Carlson DJ**. FLASH: current status and the transition to clinical use [editorial]. *Med. Phys.* 49: 1972–1973 (2022).
14. Bertolet A, Abolfath R, **Carlson DJ**, Lustig RA, Hill-Kayser C, Alonso-Basanta M, Carabe A. Correlation of LET with MRI changes in brain and potential implications for normal tissue complication probability for meningioma patients treated with pencil beam scanning proton therapy. *Int. J. Radiation. Oncol. Biol. Phys.* 112: 237–246 (2022).
15. Kashani R, Cao M, **Carlson DJ**. Radiation therapy for the treatment of cardiac arrhythmias [review]. *Int. J. Radiation. Oncol. Biol. Phys.* 112: 577–580 (2021).
16. Yan H, **Carlson DJ**, Abolfath R, Liu W. Microdosimetric investigation and a novel model of radiosensitization in the presence of metallic nanoparticles. *Pharmaceutics.* 13: 2191 (2021).
17. Willett CG, Chang DT, Czito B, Liauw SL, Wo J, Klein E, Chen Z, **Carlson DJ**, Chetty I. Reflections on Anthony Zietman from Gastrointestinal Cancer and Physics Editors [editorial]. *Int. J. Radiation. Oncol. Biol. Phys.* 111: 1114–1117 (2021).
18. Zou Z, Diffenderfer ES, Ota K, Boisseau P, Kim MK, Cai Y, Avery SM, **Carlson DJ**, Wiersma RD, Lin A, Koumenis C, Cengel K, Metz JM, Dong L, Teo BK. Characterization of a high-resolution 2D transmission ion chamber for independent validation of proton pencil beam scanning of conventional and FLASH dose delivery. *Med. Phys.* 48: 3948–3957 (2021).
19. Bertholet J, Vinogradskiy Y, Hu Y, **Carlson DJ**. Advances in image-guided adaptive radiation therapy [review]. *Int. J. Radiation. Oncol. Biol. Phys.* 110: 625–628 (2021).
20. Zou Z, Diffenderfer ES, Cengel K, Kim M, Avery S, Konzer J, Cai Y, Boisseau P, Ota K, Yin L, Wiersma R, **Carlson DJ**, Fan Y, Busch TM, Koumenis C, Lin A, Metz JM, Teo BK, Dong L. Current Delivery Limitations of Proton PBS for FLASH. *Radiother. Oncol.* 155: 212–218 (2021).
21. Hofmaier J, Dedes G, **Carlson DJ**, Parodi K, Belka C, Kamp F. Variance-based sensitivity analysis for uncertainties in proton therapy: A framework to assess the effect of simultaneous uncertainties in range, positioning and RBE model predictions on RBE-weighted dose distributions. *Med. Phys.* 48: 805–818 (2021).
22. Dominello MM, Sanders T, Anscher M, Bayouth J, Brock KK, **Carlson DJ**, Hugo G, Joseph S, Knisely J, Mendonca MS, Mian OY, Moros EG, Singh AK, Yu JB. Responses to the 2018 and

2019 "One Big Discovery" Question: ASTRO Membership's opinions on the most important research question facing radiation oncology…where are we headed? [editorial]. *Int. J. Radiat. Oncol. Biol. Phys.* 109: 38–40 (2020).

23. Toma-Dasu I, Moiseenko V, Purdie TG, **Carlson DJ**. Recent developments in the prediction of clinical outcomes data in radiation oncology [review]. *Int. J. Radiation. Oncol. Biol. Phys.* 108: 513–517 (2020).
24. Meschini M, Kamp F, Hofmaier J, Reiner M, Sharp G, Paganetti H, Belka C, Wilkens JJ, **Carlson DJ**, Parodi K, Baroni G, Riboldi M. Modeling RBE-weighted dose variations in irregularly moving abdominal targets treated with carbon ion beams. *Med. Phys.* 47: 2768–2778 (2020).
25. Abolfath R, Helo Y, **Carlson DJ**, Stewart R, Grosshans D, Mohan R. A new approach to modeling the microdosimetry of proton therapy beams. *Med. Phys.* 47: 3184–3190 (2020).
26. Paganetti H, Blakely E, Carabe-Fernandez A, **Carlson DJ**, Das IJ, Dong L, Grosshans D, Held KD, Mohan R, Moiseenko V, Niemierko A, Stewart RD, Willers H. Report of the AAPM TG-256 on the relative biological effectiveness of proton beams in radiation therapy. *Med. Phys.* 46: e53–e78 (2019).
27. Meyer S, Kamp F, Tessonnier T, Mairani A, Belka C, **Carlson DJ**, Gianoli C, Parodi K. Dosimetric accuracy and radiobiological implications of ion computed tomography for proton therapy treatment planning. *Phys. Med. Biol.* 64: 125008 (2019).
28. Guan F, Geng C, **Carlson DJ**, Ma D, Bronk L, Gates D, Wang X, Kry S, Grosshans D, Mohan R. A mechanistic relative biological effectiveness model-based biological dose optimization for charged particle radiobiology studies. *Phys. Med. Biol.* 64: 015008 (2019).
29. Tien CJ, **Carlson DJ**, Nath R, Chen ZJ. High-dose-rate brachytherapy as monotherapy for prostate cancer: The impact of cellular repair and source decay. *Brachytherapy* 18: 701–710 (2019).
30. Yu JB, Beck TF, Anscher MS, Baschnagel AM, Brock KK, **Carlson DJ**, Dominello MM, Kimple RJ, Knisely JP, Mendonca MS, Mian O, Singh AK, Moros EG, Keen JC. Analysis of the 2017 American Society for Radiation Oncology (ASTRO) Research Portfolio. *Int. J. Radiat. Oncol. Biol. Phys.* 103: 297–304 (2019).
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Letters to the Editor

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Representative Presentations

Oral Presentations at Scientific Meetings

1. **Carlson DJ**. The Yale Experience with SCINTIX Therapy. Presented at the Reflexion Luncheon at the 66th Annual Meeting of the AAPM, Los Angeles, CA, July 22 (2024).
2. **Carlson DJ**. Biologically Guided Radiation Therapy for SRS and SBRT. Presented at the IUPESM World Congress on Medical Physics and Biomedical Engineering, Singapore, June 12 (2022).
3. **Carlson DJ**. Recent advances in image-guided adaptive radiotherapy. Invited presentation at the 63rd Annual Meeting of ASTRO, Chicago, IL, October 27 (2021).
4. **Carlson DJ**. An overview of the radiobiology of hypofractionation and stereotactic radiotherapy. Invited presentation at the COMP Winter School, Virtual, February 2 (2021).
5. **Carlson DJ**. An introduction to the problem of RBE in particle therapy. Invited presentation at the Joint AAPM/COMP Annual Meeting, Virtual, July 14 (2020).
6. **Carlson DJ**. Introduction to functional imaging in adaptive radiotherapy. Invited presentation at the 61st Annual Meeting of ASTRO, Chicago, IL, September 15 (2019).
7. **Carlson DJ**. Biological dose escalation and outcomes modeling in the era of stereotactic radiotherapy. Invited presentation at the 61st Annual Meeting of the AAPM, San Antonio, TX, July 18 (2019).
8. **Carlson DJ**. RBE Modelling. Invited presentation at the 58th Annual Conference of the Particle Therapy Co-Operative Group (PTCOG), Manchester, UK, June 10 (2019).
9. **Carlson DJ**. Scientific Discussant: Outcome Analysis and Response Imaging. Invited presentation at the 60th Annual Meeting of ASTRO, San Antonio, TX, October 23 (2018).
10. Guan F, Geng C, **Carlson D***, Bronk L, Gates D, Ma D, Kerr M, Wang X, Grosshans D, Mohan R. Repair-misrepair-fixation (RMF) model-based biological dose optimization for scanned ion beams. Presented at the 60th Annual Meeting of the AAPM, Nashville, TN, August 1 (2018).
11. **Carlson DJ**. Mechanisms and models of particle relative biological effectiveness (RBE). Invited presentation at the Annual Meeting of the European Society for Radiotherapy & Oncology (ESTRO 36), Vienna, Austria, May 6 (2017).
12. **Carlson DJ**. Clinical outcomes modeling and molecular imaging for hypofractionated radiotherapy. Invited presentation at the AAPM Spring Clinical Meeting, New Orleans, LA, March 20 (2017).
13. **Carlson DJ**. AAPM governance assessment project. Presentation at the Spring Meeting of the Connecticut Area Medical Physics Society (CAMPS) chapter of the AAPM, Hartford, CT, April 12 (2017).
14. **Carlson DJ**. Clinical outcomes modeling and hypoxia imaging for stereotactic radiotherapy. Invited presentation at the 58th Annual Meeting of ASTRO, Boston, MA, September 27 (2016).
15. **Carlson DJ**. Scientific Discussant: Physics - Outcome Analysis and Modeling. Invited presentation at the 58th Annual Meeting of ASTRO, Boston, MA, September 28 (2016).
16. **Carlson DJ**. Challenges and opportunities for implementing biological optimization in particle therapy. Invited presentation and SAM session at the 58th Annual Meeting of the AAPM, Washington, DC, August 3 (2016).
17. **Carlson DJ**. Tumor hypoxia and the new paradigm of hypofractionation. Invited presentation at the Retirement Symposium for J. Martin Brown, PhD, Stanford University, Palo Alto, CA, May 20 (2016).
18. **Carlson DJ**. Why is stereotactic radiotherapy so successful? Invited presentation at the Centennial Symposium of the Center for Radiological Research (CRR) on "Radiation and Cancer: Understanding the Two-Edged Sword" at Columbia University, New York, NY, April 28 (2016).
19. **Carlson DJ**. Radiobiology of hypofractionation. Invited presentation at the American Radium Society 100th Anniversary Meeting, Philadelphia, PA, April 16 (2016).
20. **Carlson DJ**. Are more than 5 Rs involved in the tumor radiobiology of stereotactic radiotherapy? Invited presentation in the "International Symposium of Tumor Control by Radiation" at the 15th International Congress of Radiation Research (ICRR), Kyoto, Japan, May 28 (2015).

21. **Carlson DJ**. Biophysical modeling of high-dose hypofractionated radiotherapy. Invited presentation at the 56th Annual Meeting of ASTRO, San Francisco, CA, September 14 (2014).
22. **Carlson DJ**. Radiation Biology III: Biological optimization of radiation therapy. Invited presentation and SAM session at the 56th Annual Meeting of the AAPM, Austin, TX, July 24 (2014).
23. **Carlson DJ**. Towards biological optimization of radiation therapy. Invited presentation at the Winter Meeting of the New England Chapter of the AAPM, Waltham, MA, February 28 (2014).
24. **Carlson DJ**. Radiobiological models in brachytherapy planning and evaluation: basic concepts and relevant models. Invited presentation at the 55th Annual Meeting of the AAPM, Indianapolis, IN, August 8 (2013).
25. **Carlson DJ**. Isoeffect calculations for hypofractionated radiotherapy. Invited presentation at the 58th Annual Meeting of the Radiation Research Society, San Juan, Puerto Rico, September 30 (2012).
26. **Carlson DJ**, Frese MC, Yu VK, Stewart RD. A mechanism-based approach for evaluating the effects of tumor hypoxia in charged particle radiotherapy. Presented at the 53rd Annual Meeting of ASTRO, Miami Beach, FL, October 5 (2011).
27. **Carlson DJ**. Tumor hypoxia and hypofractionation: potential problems and solutions. Invited presentation at a workshop on "Hypofractionation 2011: Scientific Concepts and Clinical Experiences" organized by the University of Miami, Miami Beach, FL, September 30 (2011).
28. **Carlson DJ**. A mechanism-based approach to predict relative biological effectiveness and the effects of tumor hypoxia in charged particle radiotherapy. Invited presentation at the Joint AAPM/COMP Annual Meeting, Vancouver, Canada, August 2 (2011).
29. **Carlson DJ**. A mechanism-based approach for evaluating the effects of radiation quality and tumor hypoxia in charged particle radiotherapy. Invited presentation at a workshop on "Recent Advances in Biologically Guided Radiation Therapy" at the University of Washington, Seattle, WA, August 5 (2011).
30. **Carlson DJ**, Stewart RD. Mechanistic modeling of the relative biological effectiveness of photon, proton, and carbon ion radiation therapy. Presented at the 52nd Annual Meeting of ASTRO, San Diego, CA, November 1 (2010).
31. **Carlson DJ**, Yu VK, Stewart RD. Using Monte Carlo DNA damage simulations and deterministic repair models to examine the putative mechanisms of radiation-induced cell death. Invited presentation at the 56th Annual Meeting of the Radiation Research Society, Maui, HI, September 29 (2010).
32. **Carlson DJ**, Keall PJ, Brown JM. Hypofractionation results in a decrease in tumor cell killing compared to standard fractionation as a result of tumor hypoxia. Presented at the 49th Annual Meeting of the AAPM, Minneapolis, MN, July 25 (2007).
33. **Carlson DJ**, Keall PJ, Brown JM. Hypofractionation results in reduced tumor cell kill compared to conventional fractionation for tumors with regions of hypoxia. Presented at the workshop "Radiation Physics and Cancer Biology: Bridging the gap" at Stanford University, Stanford, CA, July 13 (2007).
34. **Carlson DJ**, Stewart RD. Effects of LET on intrinsic radiation sensitivity – tests of the putative mechanisms underlying the cell killing effects of ionizing radiation. Spotlight presentation at the 7th Annual Symposium on Biomedical Computation at Stanford, Stanford, CA, October 21 (2006).
35. **Carlson DJ**, Stewart RD. Strategies to predict the effect of hypoxia on intrinsic radiosensitivity parameters. Presented at the 47th Annual Meeting of the AAPM, Seattle, WA, July 25 (2005).
36. **Carlson DJ**, Stewart RD. Effects of hypoxia on radiation response and implications for biologically based treatment planning. Invited presentation at the workshop "Frontiers in Targeted Radiation Therapies" at Purdue University, West Lafayette, IN, April 12–13 (2005).

Invited Lectures

37. **Carlson DJ**. Does tumor hypoxia still matter in the stereotactic RT paradigm? Presented at the NIH/NCI Radiation Oncology-Biology Integration Network (ROBIN) U54 Research Seminar, March 12 (2025).

38. **Carlson DJ**. Clinical Outcomes Modeling for SBRT and SRS. Presented at the Medical Physics Seminar Series in the Department of Radiation Oncology at Yale University, New Haven, CT, November 19 (2024).
39. **Carlson DJ**. Medical Physics in Academia. Presented at the Joint COMP/AAPM 3rd Annual Joint Career Catalyst Networking Event, Virtual, October 16 (2024).
40. **Carlson DJ.** The linear-quadratic model and its application in SRS and SBRT. Presented at the International Workshop on "Accounting for Fractionation in Radiation Therapy – Is It Time to Put the BED to Bed?" hosted by Stockholm University and the Karolinska Institute, Stockholm, Sweden, September 5 (2024).
41. **Carlson DJ**. Advances in Biologically Guided Radiation Therapy for SBRT and Particle Therapy. Presented at the Medical Physics Seminar Series in the Department of Radiation Oncology at Stanford University, Stanford, CA, November 14 (2023).
42. **Carlson DJ**. SBRT/SRS radiobiology and tumor hypoxia. Presented at the International Workshop on "The Role of Oxygen in Radiation Therapy" hosted by Stockholm University and the Karolinska Institute, Stockholm, Sweden, September 5 (2023).
43. **Carlson DJ**. Mechanisms, Models, and Clinical Significance of Particle RBE. Presented at the Medical Physics Seminar Series in the Department of Radiation Oncology at Yale University, New Haven, CT, December 13 (2022).
44. **Carlson DJ**. Biologically-Guided Radiotherapy (BGRT) and the Reflexion PET/CT-Linac. Presented at the Yale Cancer Center, Radiobiology and Genome Integrity Research Program Retreat of Yale University, New Haven, CT, September 29 (2022).
45. **Carlson DJ**. Advances and Opportunities in Biologically-Guided Radiotherapy. Presented at Grand Rounds in the Department of Therapeutic Radiology at Yale University, New Haven, CT, September 22 (2022).
46. **Carlson DJ**. Radiobiological Models of Dose Response. Presented to the Medical Physics Residency Program the University of Pennsylvania, February 16 (2022).
47. **Carlson DJ**. Mechanisms and Clinical Significance of Particle RBE. Presented at the Physics Seminar of the Department of Radiation Oncology at the University of Pennsylvania, Philadelphia, PA, June 15 (2021).
48. **Carlson DJ**. Overview of Radiation Biology. Presented to the Medical Physics Residency Programs at Duke University and the University of Pennsylvania, Virtual, December 16 (2020).
49. **Carlson DJ**. First experimental investigation of simultaneously tracking two independently moving targets on an MRI-linac using real-time MRI and MLC tracking. Presented at the Physics Seminar of the Department of Radiation Oncology at the University of Pennsylvania, Philadelphia, PA, November 24 (2020).
50. **Carlson DJ**. Insights from mechanistic modeling of biological response in radiotherapy. Presented at the Physics Seminar of the Department of Radiation Oncology at the University of Pennsylvania, Philadelphia, PA, December 17 (2019).
51. **Carlson DJ**. Multiscale modeling of biological response in SBRT and particle therapy. Invited keynote speaker at the Research Retreat of the Department of Radiation Oncology at the Johns Hopkins University, Baltimore, MD, May 18 (2019).
52. **Carlson DJ**. Models and mechanisms of biological response in SBRT and particle therapy. Presented to the Department of Radiation Oncology at the University of Pennsylvania, Philadelphia, PA, July 23 (2018).
53. **Carlson DJ**. Multiscale modeling of biological response in stereotactic and particle radiotherapy. Presented to the Department of Physics at Stockholm University and the Karolinska Institute, Stockholm, Sweden, December 4 (2017).
54. **Carlson DJ**. Biologically-guided radiation therapy (BGRT): biophysical modeling for stereotactic and charged particle radiotherapy. Presented to the Department of Experimental Physics at Ludwig-Maximilians-Universität (LMU), Munich, Germany, May 10 (2017).
47. **Carlson DJ**. Practical considerations in Calypso-guided radiation therapy using TrueBeam. Presented at the Medical Physics Lecture Series for Radiation Oncology at Yale University, New Haven, CT, August 23 (2016).

48. **Carlson DJ**. The tumor biology of stereotactic radiotherapy: insights from hypoxia imaging and biophysical modeling. Presented to the Departments of Radiation Oncology and Nuclear Medicine at Seoul National University, Seoul, Korea, April 1 (2016).
49. **Carlson DJ**. The tumor radiobiology of stereotactic radiotherapy: biophysical modeling and hypoxia imaging. Presented to the Department of Radiation Oncology at Massachusetts General Hospital (MGH) & Harvard Medical School, Boston, MA, December 15 (2015).
50. **Carlson DJ**. The tumor radiobiology of stereotactic radiotherapy: are more than 5 Rs involved? Presented to the Departments of Medical Physics and Radiation Oncology at the University of Calgary, Alberta, Canada, August 14 (2015).
51. **Carlson DJ**. TrueBeam features and Calypso. Presented at Grand Rounds in the Department of Therapeutic Radiology at Yale University, New Haven, CT, May 7 (2015).
52. **Carlson DJ**. Imaging tumor hypoxia in non-small cell lung cancer patients undergoing stereotactic body radiotherapy. Presented at the Yale Cancer Center, Radiobiology & Radiotherapy Program Retreat, New Haven, CT, November 6 (2015).
53. **Carlson DJ**. Biologically-guided radiation therapy (BGRT): Isoeffect calculations for hypofractionation and charged particle radiotherapy. Presented at Grand Rounds in the Department of Therapeutic Radiology at Yale University, New Haven, CT, June 19 (2014).
54. **Carlson DJ**. A non-invasive method using electron paramagnetic resonance (EPR) spectroscopy to measure radiation dose in patients undergoing total body irradiation. Presented to the Department of Therapeutic Radiology at Yale University, New Haven, CT, May 23 (2014).
55. **Carlson DJ**. Towards biological optimization of radiation therapy. Presented to the Department of Therapeutic Radiology at Yale University, New Haven, CT, May 5 (2014).
56. **Carlson DJ**. Biologically-guided radiation therapy (BGRT): isoeffect calculations for hypofractionation and charged particle radiotherapy. Presented to the Department of Radiation Oncology at the University of Washington, Seattle, WA, June 11 (2013).
57. **Carlson DJ**. Biologically-guided radiation therapy (BGRT): isoeffect calculations for hypofractionation and charged particle radiotherapy. Presented to Department of Medical Physics, Brigham and Women's Hospital, Dana-Farber Cancer Institute & Harvard Medical School, Boston, MA, February 22 (2013).
58. **Carlson DJ**. A mechanism-based approach to predict relative biological effectiveness (RBE) and oxygen effects in particle therapy. Presented to the Department of Medical Physics at The University of Texas MD Anderson Cancer Center, Houston, TX, December 5 (2012).
59. **Carlson DJ**. A mechanism-based approach to predict relative biological effectiveness and the effects of tumor hypoxia in charged particle radiotherapy. Presented to the Department of Biology at Brookhaven National Laboratory (BNL), Upton, NY, February 3 (2012).
60. **Carlson DJ**. Current issues in SBRT treatment planning and clinical implementation. Presented to the Department of Therapeutic Radiology at Yale University, New Haven, CT, December 5 (2011).
61. **Carlson DJ**. Biologically guided radiation therapy (BGRT): applications in radiation oncology. Presented to the Department of Medical Physics at the German Cancer Research Center (DKFZ), Heidelberg, Germany, June 17 (2011).
62. **Carlson DJ**. Mechanistic modeling of the effects of radiation quality and oxygen in charged particle therapy. Presented to the Department of Medical Physics at the German Cancer Research Center (DKFZ), Heidelberg, Germany, June 14 (2011).
63. **Carlson DJ**. Mechanistic modeling of the effects of radiation quality in proton and carbon ion therapy. Presented to the Department of Radiation Oncology at Massachusetts General Hospital (MGH) & Harvard Medical School, Boston, MA, December 14 (2010).
64. **Carlson DJ**. Quantitative radiobiological modeling: applications in radiation oncology. Presented at Grand Rounds in the Department of Therapeutic Radiology at Yale University, New Haven, CT, January 28 (2010).
65. **Carlson DJ**. Overview and commissioning of the RadCalc MU calculation software. Presented to the Department of Therapeutic Radiology at Yale University, New Haven, CT, February 16 (2009).

66. **Carlson DJ**. Quantitative radiobiological modeling: applications in radiation oncology physics *and* Management of 3D intrafraction motion with a dynamic multi-leaf collimator. Presented to the Department of Therapeutic Radiology at Yale University, New Haven, CT, August 4 (2008).
67. **Carlson DJ**. Quantitative radiobiological modeling: applications in radiation oncology physics *and* Management of 3D intrafraction motion with a dynamic multi-leaf collimator. Presented to the Department of Radiation Oncology at the University of Washington, Seattle, WA, July 18 (2008).
68. **Carlson DJ**. Quantitative radiobiological modeling: applications in radiation oncology physics *and* Management of 3D intrafraction motion with a dynamic multi-leaf collimator. Presented to the Radiation Oncology Department at the Fox Chase Cancer Center, Philadelphia, PA, June 9 (2008).
69. **Carlson DJ**. Quantitative radiobiological modeling: applications in radiation oncology physics *and* Management of 3D intrafraction motion with a dynamic multi-leaf collimator. Presented to the Department of Radiation Oncology at the Swedish Cancer Institute, Seattle, WA, May 14 (2008).
70. **Carlson DJ**. Quantitative radiobiological modeling: applications in radiation oncology physics *and* Management of 3D intrafraction motion with a dynamic multi-leaf collimator. Presented to the Department of Radiation Oncology at William Beaumont Hospital, Royal Oak, MI, May 8 (2008).
71. **Carlson DJ**. Quantitative radiobiological modeling: applications in radiation oncology physics *and* Management of 3D intrafraction motion with a dynamic multi-leaf collimator. Presented to the Department of Radiation Oncology at the University of Utah, Salt Lake City, UT, May 1 (2008).
72. **Carlson DJ**. Mechanisms of intrinsic radiation sensitivity: the effects of DNA damage repair, oxygen, and radiation quality. Presented to the Department of Radiation Oncology at Stanford University, Stanford, CA, July 25 (2006).
73. **Carlson DJ**. *In vitro* and *in vivo* radiation response: applications in radiation oncology physics. Presented to the Department of Radiation and Cellular Oncology at the University of Chicago, Chicago, IL, February 6 (2006).

Oral Presentations by Mentored Trainees at Scientific Meetings

74. Kassaee A, Lin H, Xu L, Philbrook S, Dong L, **Carlson D**, Li T. SBRT on Halcyon Linear Accelerator: Exploring Dosimetric Impact of Residual Rotational Error after Correcting for Translational Setup Errors. Presented at the Annual Scientific Meeting of the Radiosurgery Society (RSS), Carlsbad, CA, March 4 (2022) [*Resident/Trainee Physics Abstract Award Winner*].
75. Draeger E, Roberts K, Decker RD, Wilson LD, Husain Z, Contessa J, Williams B, Flood A, Swartz H, **Carlson D**. Using electron paramagnetic resonance for *in vivo* biodosimetry in radiotherapy patients. Presented at the 61st Annual Meeting of the AAPM, San Antonio, TX July 16 (2019).
76. Butkus MP, Stewart RD, **Carlson DJ**. Mechanisms of particle relative biological effectiveness (RBE) – effects of DSB clustering on the nanometer scale. Presented at the 58th Annual Meeting of the Particle Therapy Co-Operative Group (PTCOG), Manchester, UK, June (2019).
77. Butkus M, Stewart R, Chen Z, **Carlson D**. Double strand break complexity and proximity effects within the repair-misrepair fixation (RMF) model for improved predictions of cell survival from heavy ions. Presented at the 60th Annual Meeting of the AAPM, Nashville, TN, July 31 (2018).
78. Meyer S, Kamp F, Mairani A, Belka C, **Carlson D**, Gianoli C, Parodi K. Quantitative comparison of proton, helium- and carbon-ion computed tomography for ion therapy treatment planning. Presented at the 60th Annual Meeting of the AAPM, Nashville, TN, July 31 (2018).
79. Kann BH, Yu JB, Bond J, Loiselle C, Chiang VL, Bindra RS, Gerrard JL, **Carlson DJ**. The impact of Cobalt-60 source age on biologically effective dose in Gamma Knife thalamotomy. Oral presentation at the 18th International Leksell Gamma Knife Society Meeting, Amsterdam, Netherlands, May 17 (2016).
80. Kamp F, **Carlson D**, Wilkens J. Fast biological RBE modeling for carbon ion therapy using the repair-misrepair-fixation (RMF) model. Oral presentation at the 35th Annual Meeting of the European Society for Radiotherapy and Oncology (ESTRO), Turin, Italy, May 1 (2016).
81. Kelada OJ, Decker RH, Zheng M, Huang Y, Xia Y, Gallezot J, Liu C, Rockwell S, Carson RE, Oelfke U, **Carlson DJ**. Dynamic PET imaging of tumor hypoxia in non-small cell lung cancer patients undergoing stereotactic body radiotherapy. Oral presentation at the 101st Annual Meeting of the Radiological Society of North America (RSNA), Chicago, IL, December 4 (2015).

82. Kelada OJ, **Carlson DJ**. Hypofractionated radiotherapy: from technological advances to personalized therapy for cancer patients. Invited oral presentation at the Scholars-In-Training (SIT) Workshop of the 61st Annual Meeting of the Radiation Research Society (RRS), Weston, FL, September 18 (2015).
83. Bahar B, Roberts K, Stabile F, Mongillo N, Decker R, Wilson L, Husain Z, Contessa J, Williams B, Flood A, Swartz H, **Carlson D**. Non-invasive *in vivo* biodosimetry in radiotherapy patients using electron paramagnetic resonance (EPR) spectroscopy. Oral presentation at the 57th Annual Meeting of the AAPM, Anaheim, CA, July 12 (2015).
84. Kelada OJ, Decker RH, Zheng MQ, Huang Y, Xia Y, Gallezot JD, Liu C, Rockwell S, Carson RE, Oelfke U, **Carlson DJ**. Quantification of tumor hypoxia in lung cancer patients undergoing stereotactic body radiotherapy using dynamic PET imaging. Oral presentation at the 15th International Congress of Radiation Research (ICRR), Kyoto, Japan, May 27 (2015).
85. Kelada OJ, Decker RH, Zheng MQ, Huang Y, Xia Y, Gallezot JD, Liu C, Rockwell S, Carson RE, Oelfke U, **Carlson DJ**. Quantification of tumor hypoxia in lung cancer patients undergoing stereotactic body radiotherapy using dynamic PET imaging. Oral and poster presentation at the 8th International Workshop on Microbeams (IWM), Fukui, Japan, May 31 (2015).
86. Kelada O, Decker RH, Zheng M, Huang Y, Xia Y, Gallezot J, Liu C, Rockwell S, Carson RE, Oelfke U, **Carlson DJ**. Serial imaging of tumor hypoxia in early stage non-small cell lung cancer patients undergoing stereotactic body radiotherapy. Oral presentation in "Best in Physics" session at the 56th Annual Meeting of ASTRO, San Francisco, CA, September 15 (2014).
87. Kelada O, Decker R, Zheng M, Huang Y, Xia Y, Gallezot J, Liu C, Rockwell S, Carson R, Oelfke U, **Carlson D**. Variation in dynamic positron emission tomography imaging of tumor hypoxia in early stage non-small cell lung cancer patients undergoing stereotactic body radiotherapy. Oral presentation at the 56th Annual Meeting of the AAPM, Austin, TX, July 23 (2014).
88. Kelada O, Rockwell S, Carson RE, Decker RH, Oelfke U, **Carlson DJ**. Quantification of tumor hypoxia using [^{18}F]-FMISO positron emission tomography and tracer kinetic modeling. Oral presentation at the 55th Annual Meeting of the AAPM, Indianapolis, IN, August 5 (2013).
89. Abolfath R, **Carlson D**, Chen Z, Nath R. Molecular dynamics simulation of DNA damage induction by ionizing radiation. Oral presentation at the 55th Annual Meeting of the AAPM, Indianapolis, IN (2013).

Conference Posters (without published conference proceeding)

90. Zou W, Diffenderfer ES, Cengel KA, Kim MM, Avery S, Wiersma R, **Carlson DJ**, Busch TM, Koumenis C, Lin A, Metz JM, Teo BK, Dong L. Current Delivery Limitations of Proton PBS for FLASH. Presented at the 66th Annual Meeting of the Radiation Research Society, Virtual, October 18-21 (2020).
91. Kelada OJ, Decker RH, Zheng MQ, Huang Y, Xia Y, Gallezot JD, Liu C, Rockwell S, Carson RE, Oelfke U, **Carlson DJ**. Quantification of tumor hypoxia in lung cancer patients undergoing stereotactic body radiotherapy using dynamic PET imaging. Presented at the 12th International Workshop on Microbeam Probes of Cellular Radiation Response, Tsuruga, Fukui, Japan, May 30-June 1 (2015).
92. Kelada OJ, Rockwell S, Zheng M, Huang Y, Carson RE, Booth CJ, Decker RH, Oelfke U, **Carlson DJ**. Quantification of hypoxic tumor volumes with [^{18}F]-fluoromisonidazole positron emission tomography, eppendorf pO_2 measurements, and carbonic anhydrase IX staining. Presented at the 59th Annual Meeting of the Radiation Research Society, New Orleans, LA, September 14-September 18 (2013).
93. Abolfath R, **Carlson DJ**, Chen ZJ, Nath R. A molecular dynamics simulation of DNA damage by ionizing radiation. Presented at the 58th Annual Meeting of the Radiation Research Society, San Juan, Puerto Rico, September 30-October 3 (2012).
94. **Carlson DJ**, Keall PJ, Brown JM. Hypofractionation results in reduced tumor cell kill compared to conventional fractionation for tumors with regions of hypoxia. Presented at the 13th International Congress of Radiation Research (ICRR), San Francisco, CA, July 8–12 (2007).

95. **Carlson DJ**, Stewart RD, Sandison GA. Tests of the putative mechanisms underlying the cell killing effects of low and high LET ionizing radiation. Presented at the 53rd Annual Meeting of the Radiation Research Society, Philadelphia, PA, November 5–8 (2006).
96. **Carlson DJ**, Stewart RD, Jennings K, Park J. A mechanism-based method to predict LQ radiosensitivity parameters for hypoxia. Presented at the 51st Annual Meeting of the Radiation Research Society, St. Louis, MO, April 24–27 (2004).
97. Greist TM, Stewart RD, **Carlson DJ**, Jennings K, Park J. Optimal Experimental Designs for the Estimation of LQ Radiosensitivity Parameters. Presented at the 51st Annual Meeting of the Radiation Research Society, St. Louis, MO, April 24–27 (2004).
98. **Carlson DJ**, Stewart RD, Li XA, Wang JZ, Guerrero M. Can intrinsic radiosensitivity be reliably estimated from survival data for high dose rate irradiation conditions? Presented at the 12th International Congress of Radiation Research (ICRR), Brisbane, AUS, August 17–22 (2003).
99. Stewart RD, **Carlson DJ**, Jennings K. The Virtual Cell and Multi-Endpoint Data Analysis. Presented at the 12th International Congress of Radiation Research (ICRR), Brisbane, AUS, August 17–22 (2003).

Teaching Experience

Yale University, Department of Therapeutic Radiology, Professor: 2022–present

Course: *Physics of Radiation Therapy for Residents* (2022–present)
Delivered lectures on linear accelerators, linac collimation systems, alternative teletherapy modalities, interactions of x- and gamma-rays with matter, attenuation of photon beams, interactions of particulate radiation, and particle therapy, developed problem sets, and held review sessions

Course: *Radiobiology for Residents* (2022–present)
Delivered two lectures on models of cell survival and developed problems for exam

Residency program: *Radiation Oncology Physics* (2022–present)
Served on program committee, participated in semi-annual oral examinations

University of Pennsylvania, Department of Radiation Oncology, Associate Professor: 2019–2022

Course: *MPHY700 Clinical Practicum* (2019–current)
Course Director for Clinical Practicum. Students placed at designated sites and expected to complete clinical rotations to provide practical experience in medical physics in a clinical setting. Practicum designed to give a better understanding of instrumentation methodology, calibration, treatment planning and quality assurance.

Course: *MPHY606 Physics of Radiation Therapy* (2019–current)
Delivered two lectures on Radiation Biology for medical physicists, developed homework and exam

Course: *MPHY 699 Independent Study* (2020–current)
Supervised two independent study projects for the Medical Physics Graduate program on "Investigating SBRT on Halcyon"

Course: *Radiotherapy Physics for Medical Residents* (2020–current)
Delivered lecture on Photon Interaction of Radiation with Matter for Medical Residents

Medical Physics Resident Orientation (2019–current)
Delivered introductory lecture on Penn Radiation Oncology for medical physics residents

Medical Physics Graduate Student Orientation (2019–current)
Delivered introductory lecture on Penn Radiation Oncology for medical physics graduate students

Yale University, Department of Therapeutic Radiology, Associate/Assistant Professor: 2008–2019

Course: *Physics of Radiation Therapy for Residents* (2008–2019)
Delivered lectures on linear accelerators, linac collimation systems, alternative teletherapy modalities, interactions of x- and gamma-rays with matter, attenuation of photon beams, interactions of particulate radiation, and particle therapy, developed problem sets, and held review sessions

Course: *Radiobiology for Residents* (2010–2019)
Delivered two lectures on models of cell survival and developed problems for exam

Residency program: *Radiation Oncology Physics* (2012–2019)
Served on program committee and as a rotation advisor, participated in semi-annual oral examinations

Stanford University, Department of Radiation Oncology, Guest Lecturer: 2006–2008

Short Course: *Image Guided Radiation Therapy (IGRT)* (2007, 2008)
Delivered lectures on image fusion and IGRT treatment planning, coordinated practical demonstrations, and demonstrated gated treatment planning and delivery (Director: Lei Xing, Ph.D.)

Postdoctoral Fellow Clinical Training Program (2006–2008)
Organized and implemented clinical training of postdoctoral fellows in radiation oncology physics

Medical Resident Orientation (2007)
Delivered lectures on the physics of radiation therapy for medical residents

Short Course: *Respiratory Gating Training* (2006)
Practical demonstrations of gated IMRT treatment delivery, dosimetric tests, and positional tests using the Varian Trilogy on-board imaging device (Director: Paul Keall, Ph.D.)

Purdue University, School of Health Sciences, Guest Lecturer: 2005–2006

Course: *Radiation Biology* for graduate and under-graduate students
Delivered lectures on normal tissue damage, tolerance doses, and complication probability models

Purdue University, School of Health Sciences, Teaching Assistant: 2002–2004

Courses: *Health Sciences Professions*, *Radiation Detection and Measurement*, and *Radiation Biology*

Middlebury College, Department of Physics, Teaching Assistant: 1999–2002

Courses: *Newtonian Physics*, *Physics in the Universe*, *Observational Astronomy and Data Analysis*

University Service

Yale University

Radiation Safety Committee (RSC) for **Yale New Haven Hospital**

Chair (2022–present)

Cancer Senior Leadership Group (CSLG) for **Yale New Haven Hospital/Yale School of Medicine**

Member (2023–present)

Quality Improvement Committee for the **Department of Radiation Oncology**

Member (2022–present)

Standardization Committee for the **Department of Radiation Oncology**

Member (2022–present)

Program Committee for the **Yale Medical Physics Residency Program**

Member (2012–2019, 2022–present)

Clinical Competence Committee for the **Yale Radiation Oncology Residency Program**

Member (2013–2019)

Departmental Thesis Committee for the **Yale Department of Therapeutic Radiology**
Member (2014–2019)

Scientific Reviewer of **Pilot Grants** for the **Yale Cancer Center**
Reviewer (2016–2019)

Scientific Reviewer of **Grants** for the **Yale Cancer Innovation Award (YCIA)**
Reviewer (2019)

Faculty Search Committee for the **Department of Radiology and Biomedical Engineering**
Member (2016)

University of Pennsylvania

Senior Governance Committee for the **Department of Radiation Oncology**

Member (2021–2022)

Proton Steering Committee for the **Department of Radiation Oncology**

Member (2019–2022)

Quality Care Committee for the **Department of Radiation Oncology**

Member (2019–2022)

Data Governance Committee for the **Department of Radiation Oncology**

Member (2020–2022)

Faculty Mentoring Committee for the **Department of Radiation Oncology**

Member (2019–2022)

Operations Oversight Committee for the **Department of Radiation Oncology**

Member (2019–2021)

Student Training Experience

PhD Students

Olivia J. Kelada, M.Sc.: May 2012–May 2015
Postgraduate Fellow visiting from University of Heidelberg/German Cancer Research Center DKFZ
Florian Kamp, Ph.D.: September–December 2013
Postgraduate Fellow visiting from the Technical University of Munich
Malte C. Frese, Ph.D.: August–December 2010
Postgraduate Associate visiting from University of Heidelberg/German Cancer Research Center DKFZ
Victor K. Yu, M.S.: June–November 2010
Postgraduate Associate visiting from Purdue University

Masters Students

Anthony Kassaee: August 2020–2022
Mentoring student on two independent clinical projects for course credit on "SBRT for Halcyon"
Haram (Ryan) Kim: August 2020–2022
Mentor and thesis reader for thesis on "A Mathematical Model for Radiolytic Oxygen Depletion effect on Effective Proton PBS Dose under FLASH"
Weili Zhong, Ph.D.: September 2020–2022
Served as Career Mentor for the Medical Physics Graduate Program

Physics Residents

Emily Draeger, Ph.D.: July 2018–2019
Supervised clinical rotations, provided oral examinations, and supervised research project on *in vivo* biodosimetry using electron paramagnetic resonance (EPR) spectroscopy

Muhammad Shafiq ul Hassan, Ph.D.: July 2018–2019
Supervised clinical rotations and provided oral examinations

Michael Petrongolo, Ph.D.: July 2016–June 2018
Supervised clinical rotations and provided oral examinations

Michael Butkus, Ph.D.: July 2015–August 2018
Supervised clinical rotations, provided oral examinations, and supervised research project on double strand break (DSB) complexity and proximity effects within the repair-misrepair-fixation (RMF) model for improved predications of cell survival for heavy ions

Huixiao Chen, Ph.D.: July 2014–June 2016
Supervised clinical rotations and provided oral examinations

Ramin Abolfath, Ph.D.: July 2012–June 2015
Supervised clinical rotations, provided oral examinations, and supervised research project on Monte Carlo and molecular dynamics simulation of radiation-induced DNA damage

Hassan Abbas, Ph.D.: July 2012–June 2014
Supervised clinical rotations, provided oral examination, and supervised research project on the use of onboard portal dosimetry for patient-specific QA of RapidArc treatments

Research Associates

Francis Stabile, M.S.: November 2014–August 2015
Postgraduate Associate working on *in vivo* biodosimetry project using EPR spectroscopy

Nicholas Mongillo, B.A.: November 2014–August 2015
Postgraduate Associate working on *in vivo* biodosimetry project using EPR spectroscopy

Maryam Khalili, Ph.D.: March–September 2014
Research Associate working on *in vivo* biodosimetry project using EPR spectroscopy

Nina Bahar, M.S.: March–July 2014
Postgraduate Associate working on *in vivo* biodosimetry project using EPR spectroscopy

Media

Host of Red Journal Podcast for the *International Journal of Radiation Oncology, Biology, Physics*, July 15, 2023: https://www.redjournal.org/audio-do/red-journal-podcast-july-15-2023

Invited Guest, National Public Radio (WNPR), Yale Cancer Center Answers, "The Role of Radiation in Treating Cancer," April 27, 2014: https://www.yalemedicine.org/podcasts/cancer-answers-the-role-of-radiation-in-treating-cancer-april-27-2014

Research highlighted in article on *physicsworld*, "Ion-beam CT improves particle therapy planning," August 16, 2018: https://physicsworld.com/a/ion-beam-ct-improves-particle-therapy-planning/

Research highlighted in article on *physicsworld*, "How does SBRT impact tumour hypoxia?," August 10, 2018: https://physicsworld.com/a/how-does-sbrt-impact-tumour-hypoxia/

Research in Medicine@Yale newsletter, Vol. 9(1), "Mapmakers of the living human body," March 2013: http://www.medicineatyale.org/march2013/news/newsarticles/148993/

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Skills

Computer

C#, MATLAB, FORTRAN, R, SAS, Mathematica, SigmaPlot, HTML

Languages

Proficient in French, basic Malagasy