

RICHARD L. FROCK, PhD

Assistant Professor

Department of Radiation Oncology
Stanford University School of Medicine

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EDUCATIONAL BACKGROUND

12/18/2009 - Ph.D. in Biochemistry, University of Washington

05/20/2001 - B.A. in Biochemistry, Vassar College

PROFESSIONAL APPOINTMENTS

- 01/01/2018-
present **Assistant Professor, University Tenure Line**
Stanford University School of Medicine, Stanford, CA
Department of Radiation Oncology, Division of Radiation and Cancer Biology
- 01/01/2022-
12/31/2022 **Assistant Professor**, Radiation Oncology – Radiation and Cancer Biology appointment extension
- 01/01/2023-
12/31/2023 **Assistant Professor**, Radiation Oncology – Radiation and Cancer Biology appointment extension
- 02/01/2010-
12/15/2017 **Research Fellow**
Harvard Medical School, Department of Genetics, Boston, MA
Boston Children’s Hospital, Program in Cellular and Molecular Medicine, Boston, MA
Mentor: Frederick W. Alt
Research Focus: Mechanisms of DSB repair and chromosomal translocations during V(D)J and Class Switch Recombination using Linear Amplification-Mediated High-Throughput Genome-wide Translocation Sequencing (LAM-HTGTS)
- 10/01/2001-
12/18/2009 **Predoctoral Research Associate**
University of Washington, Department of Biochemistry, Seattle, WA
Mentors: Brian K. Kennedy & Steve D. Hauschka
Committee members: Richard D. Palmiter, David R. Morris, Stephen J. Tapscott, Edith H. Wang, Stephen M. Schwartz
Dissertation: A Role for A-Type Nuclear Lamins in the Homeostasis of Striated Muscle and the Immune System

HONORS AND AWARDS

- 2023 Research Scholar, American Cancer Society - Lisa Dean Moseley Foundation Stem Cell Consortium
- 2022 Best Oral Presentation, 2nd Flash Radiotherapy and Particle Therapy Conference
- 2022 Early Career Investigator Travel Award, Radiation Research Society
- 2019 V Scholar, V Foundation for Cancer Research
- 2019 Early Career Investigator Travel Award, Radiation Research Society
- 2019 Radiation Research Foundation Career Development Award
- 2014 Allergic and Immunologic Disease Postdoctoral National Research Service Award
- 2014 Boston Children’s Hospital PCMM Scientific Retreat Poster Award

- 2011 Northwest Genomic Engineering Consortium Travel Award
- 2011 Immune Disease Institute Scientific Retreat Poster Award
- 2010 Cancer Immunology Postdoctoral National Research Service Award
- 2008 North American Vascular Biology Organization Vasculata Poster Award
- 2006 Cardiovascular and Pathology Predoctoral National Research Service Award
- 2006 Schultz Cancer Biology Travel Award

PRE-PRINTS

1. Pannunzio N, Rangel V, Sterrenberg J, Garawi A, Mezcord V, Folkerts M, Caulderon S, Wang J, Soyfer E, Eng O, Valerin J, Tanjasiri S, Quintero-Rivera F, Masri S, Seldin M, **Frock R**, Fleischman A. (Sept 2023) Increased AID Results in Mutations at the CRLF2 Locus Implicated in Latin American ALL Health Disparities [Research Square](#). doi: [10.21203/rs.3.rs-3332673/v1](https://doi.org/10.21203/rs.3.rs-3332673/v1)

PUBLICATIONS

PEER-REVIEWED ORIGINAL RESEARCH PUBLICATIONS (23 total)

23. Wang J, Sadeghi SA, **Frock RL**. 2024 DNA-PKcs Suppresses Illegitimate Chromosome Rearrangements [Nucleic Acids Research](#). doi: [10.1093/nar/gkae140](https://doi.org/10.1093/nar/gkae140)
22. Wang J, Le Gall J, ***Frock RL**, Strick TR. Shifted PAMs generate DNA overhangs and enhance SpCas9 post-catalytic complex dissociation. [Nature Structural & Molecular Biology](#) 2023 Oct 12
*Design, data acquisition, data analysis and interpretation, supervision, funding, commented on manuscript
21. Barghouth PG, Melemenidis S, Montay-Gruel P, Ollivier J, Viswanathan V, Gonçalves PJ, Soto LA, Lau BC, Sadeghi C, Edlabadkar A, Zhang R, Ru N, Baulch JE, Manjappa R, Wang J, Le Bouteiller M, Surucu M, Yu A, Bush K, Skinner L, Maxim P, Loo Jr. BW, Limoli C, Vozenin M-C, **Frock RL**. FLASH-RT does not affect chromosome translocations and junction structures beyond that of CONV-RT dose-rates. [Radiotherapy and Oncology](#) 2023 Sep 9:188:109906
Special issue on 2022 *FLASH Radiotherapy and Particle Therapy Conference (FRPT)*.
Invited for special issue on *16th International Wolfsberg Meeting on Molecular Radiation Biology*.
20. Lattanzi A, Camarena J, Lahiri P, Segal H, Srifa W, Vakulskas CA, ***Frock RL**, Kenrick J, Lee C, Talbott N, Skowronski J, Cromer MK, Charlesworth CT, Bak RO, Mantri S, Bao G, DiGiusto D, Tisdale J, Wright JF, Bhatia N, Roncarolo MG, Dever DP, Porteus MH. Development of β -globin gene correction in human hematopoietic stem cells as a potential durable treatment for sickle cell disease. [Science Translational Medicine](#). 2021 Jun 16;13(598):eabf2444. DOI: 10.1126/scitranslmed.abf2444.
*Conception and design, data acquisition, data analysis and interpretation, supervision, funding, commented on manuscript
19. Liang Z, Kumar V, Le Bouteiller M, Zurita J, Kenrick J, Lin SG, Lou J, Hu J, Ye AY, Boboila C ♦Alt FW, ♦**Frock RL**. Ku70 suppresses alternative end-joining in G1-arrested progenitor B cells. [Proc. Natl. Acad. Sci. USA](#). 2021 May 25;118 (21):e2103630118. PMC8166026.
Featured as Publication of the Week in [SCIENCE IN THE CITY](#)
18. Wang Q, Liu J, Janssen JM, Le Bouteiller M, ***Frock RL**, Gonçalves MAFV. Precise and broad scope genome editing based on high-specificity Cas9 nickases. [Nucleic Acids Research](#). 2021 Jan 25;49(2):1173-1198. PMC7826261.
*Conception and design, data interpretation, supervision, commented on manuscript and revision
17. Chen X, Tasca F, Wang Q, Liu J, Janssen, Brescia MD, Bellin M, Szuhai K, Kenrick J, ***Frock RL**, Gonçalves MAFV. Expanding the editable genome and CRISPR-Cas9 versatility using DNA cutting-free gene targeting based on in trans paired nicking. [Nucleic Acids Research](#). 2020 Jan 24;48(2):974-995. PMC6954423.

*Conception and design, data acquisition, data analysis and interpretation, supervision, commented on manuscript and revision

16. Layer JV, Cleary J, Brown AJ, Stevenson KE, Morrow SN, Scoyk AV, Blasco RB, Karaca E, Meng F, ***Frock RL**, Tivey T, Kim SS, Fuchs H, Chiarle R, Alt FW, Roberts SA, Weinstock DM, Day TA. Parp3 promotes long-range end-joining in murine cells. *Proc Natl Acad Sci U S A*. 2018 Oct 2;115(40):10076-10081. PMC6176633.
*Designed and performed experiments, analyzed sequencing data, commented on manuscript
15. Willis NA, ***Frock RL**, Menghi F, Duffey EE, Panday A, Camacho V, Hasty EP, Liu ET, Alt FW, Scully R. Mechanism of tandem duplication formation in BRCA1-mutant cells. *Nature*. 2017 Nov 30;551(7682):590-595. PMC5728692.
*Designed and performed experiments, analyzed sequencing data, commented on manuscript
14. Paulsen BS, Mandal PK, ***Frock RL**, Boyraz B, Yadav R, Gutierrez-Martinez P, Ebina W, Fasth A, Talkowski ME, Agarwal S, Alt FW, Rossi, DJ. Ectopic expression of RAD52 and dn53BP1 improves homology-directed repair during CRISPR/Cas9-mediated genome editing. *Nature Biomedical Engineering*. 2017 Nov;1(11):878-888. PMC6918705.
Featured in *Nature Biomedical Engineering*.
*Designed and performed experiments, analyzed sequencing data, commented on manuscript
13. †Kumar V, Alt FW, †**Frock RL**. PAXX and XLF DNA repair factors are functionally redundant in joining DNA breaks in a G1-arrested progenitor B-cell line. *Proc Natl Acad Sci U S A*. 2016 Sep 20;113(38):10619-24. PMC5035843.
Briefly highlighted in *Cell Reports* Facebook post 10/6/2016
12. †Zhao L, †**Frock RL**, Du Z, Hu J, Chen L, Krangel MS, Alt FW. Orientation-specific RAG activity in chromosomal loop domains contributes to Tcrd V(D)J recombination during T cell development. *Journal of Experimental Medicine*. 2016 Aug 22;213(9):1921-1936. PMC4995090.
11. Hu J, Meyers RM, Dong J, Panchakshari RA, †Alt FW, †**Frock RL**. Detecting DNA double-stranded breaks in mammalian genomes by linear amplification-mediated high-throughput genome-wide translocation sequencing. *Nature Protocols*. 2016 May;11(5):853-71. PMC4895203
10. Hu J, Zhang, Y, Zhao L, **Frock RL**, Du Z, Meyers RM, Meng FL, Schatz DG, Alt FW. Chromosomal loop domains direct the recombination of antigen receptor genes. *Cell*. 2015 Nov 5;163(4):947-59. PMC4660266
Featured in *Trends in Molecular Medicine*
9. †**Frock RL**, †Hu J, Meyers RM, Ho YJ, Kii E, Alt FW. Genome-wide detection of DNA double-stranded breaks induced by engineered nucleases. *Nature Biotechnology*. 2015 Feb;33(2):179-86. PMC4320661
Featured in *Nature Biotechnology* and *Molecular Cell*
8. †**Frock RL**, †Chen SC, Dai DF, Pak DN, Frett E, Lau C, Brown C, Wang Y, Rabinovitch PS, Santana LS, Ladiges WC, Worman HJ, Kennedy BK. Cardiomyocyte-specific expression of lamin A improves cardiac function in *Lmna*^{-/-} mice. *PLoS One*. 2012 7(8):e42918. PMC3419749.
7. †Chiarle R, †Zhang Y, †**Frock RL**, †Lewis SM, Molinie B, Ho YJ, Myers DR, Choi VW, Compagno M, Malkin DJ, Neuberger D, Monti S, Giallourakis CC, Gostissa M, Alt FW. Genome-wide Translocation Sequencing Reveals Mechanisms of Chromosome Breaks and Rearrangements in B Cells. *Cell*. 2011 Sep 30;147(1):107-19. PMC3186939
Featured in *Cell* and *Nature Reviews Genetics*
6. †Hale JS, †**Frock RL**, Mamman SA, Fink PJ, Kennedy BK. Cell-extrinsic defective lymphocyte development in *Lmna*^{-/-} mice. *PLoS One*. 2010 5(4):e10127. PMC2853576.

5. #Frock RL, Kudlow BA, Evans AM, Jameson SA, Hauschka SD, Kennedy BK. Lamin A/C and emerin are critical for skeletal muscle satellite cell differentiation. *Genes Dev.* 2006 20(4): 486-500. PMC1369050.
4. Johnson BR, Nitta RT, Frock RL, Mounkes L, Barbie DA, Stewart CL, Harlow E, Kennedy BK. A-type lamins regulate retinoblastoma protein function by promoting subnuclear localization and preventing proteasomal degradation. *Proc Natl Acad Sci U S A.* 2004 101(26): 9677-9682. PMC470734.
3. Barbie DA, Kudlow BA, Frock R, Zhao J, Johnson BR, Dyson N, Harlow E, Kennedy BK. Nuclear reorganization of mammalian DNA synthesis prior to cell cycle exit. *Mol Cell Biol.* 2004 24(2): 595-607. PMC343811.
2. #Deng WM, Schneider M, Frock R, Castillejo-Lopez C, Gaman EA, Baumgartner S, Ruohola-Baker H. Dystroglycan is required for polarizing the epithelial cells and the oocyte in Drosophila. *Development.* 2003 130(1): 173-184.
1. Pfennig BW and Frock RL. The use of molecular modeling and VESPR theory in the undergraduate curriculum to predict the three-dimensional structure of molecules. *J Chem Ed* 1999 7: 1018- 1022.

✦Co-first author; ✦Co-corresponding author; #Journal cover

PEER-REVIEWED ARTICLES (OTHER – 2 total)

2. Frock RL, Sadeghi C, Meng J, Wang JL. DNA End Joining: G0-ing to the Core. *Biomolecules* 2021 Oct 9;11(10):1487. PMC8533500 (corresponding author)
1. Smith ED, Kudlow BA, Frock RL, Kennedy BK. A-type nuclear lamins, progerias and other degenerative disorders. *Mech Ageing Dev.* 2005 126(4): 447-460. DOI: 10.1016/j.mad.2004.10.006

BOOK CHAPTERS (1 total)

1. ✦Frock RL, ✦Hu J, Alt FW. Mechanisms of recurrent chromosomal translocations. In Janet Rowley, Terence Rabbitts, & Michelle LeBeau (Eds.) *Chromosomal Translocations and Genome Rearrangements in Cancer*. Switzerland: Springer International Publishing, 2015. Pp. 27-51. DOI: 10.1007/978-3-319-19983-2

✦Co-first author

PUBLISHED MEETING ABSTRACTS (5 total)

5. Barghouth PG, Ollivier J, Montay-Gruel P, Loo BW, Vozenin M, Limoli C, Frock RL. 2021. Ultra-high dose rate (FLASH) irradiation does not alter microhomology mediated recombination under varying oxygen tension when compared to standard clinical dose rates. *Clin Cancer Res* 27:8s PO-012. DOI: [10.1158/1557-3265.RADSCI21-PO-012](https://doi.org/10.1158/1557-3265.RADSCI21-PO-012)
4. Frock RL, Kumar V, Liang Z, Zurita J, Du Z, Lin SG, Boboila C, Alt FW. 2019 Ku70 suppresses alternative end-joining in G1-arrested progenitor B cells. *Cancer Res* 79:13s 1745. DOI: [10.1158/1538-7445.AM2019-1745](https://doi.org/10.1158/1538-7445.AM2019-1745)
3. Vanoli F, Ito S, Frock RL, Alt FW, Moynahan M, Jasin M, 2017. PARP inhibitor Olaparib induces genomic instability in normal mammalian cells. *Mol Cancer Res* 15:4s B37. DOI: [10.1158/1557-3125.DNAREPAIR16-B37](https://doi.org/10.1158/1557-3125.DNAREPAIR16-B37)
2. Mandal PK, Paulsen BS, Frock RL, Gutierrez-Martinez P, Ebina W, Agarwal S, Alt FW, Rossi DJ. 2016. Transient Manipulation of DNA Damage Repair Pathway Choice Improves Homology-Directed Repair During CRISPR/Cas9-Mediated Genome Editing. *Mol Ther* 24:1s pS227 568. DOI: [10.1016/S1525-0016\(16\)33376-7](https://doi.org/10.1016/S1525-0016(16)33376-7)
1. Hu J, Zhang Y, Zhao L, Frock RL, Du Z, Meyers RM, Meng FL, Schatz DG, Alt FW. 2016.

Curriculum Vitae: updated February 29, 2024 | Richard L. Frock
Topologically associated domains genome-wide restrict the off-target activity of recombination activating gene 1/2 endonuclease. *Cancer Immunol Res* 4:1s A180. DOI: [10.1158/2326-6074.CRICIMTEATIAACR15-A180](https://doi.org/10.1158/2326-6074.CRICIMTEATIAACR15-A180)

EDITORIAL SERVICE

- **Associate Editor (2023-present)**
 - Genome Editing in Human Health and Disease, *Frontiers in Genome Editing*
- **Review Editor (2021-present)**
 - Genome Editing in Blood Disorders, *Frontiers in Genome Editing*
 - Genome Organization and Dynamics, *Frontiers in Molecular Biosciences*
- **Ad hoc Reviewer (2018-present):**
 - *Nature Structural & Molecular Biology, Nature Protocols, Nucleic Acids Research, Nature Communications, PLoS ONE, Trends in Cancer*
 - *Frontiers in Genetics* (Public Reviewer): Libri A, Marton T, Deriano L. The (lack of) DNA double-strand break repair pathway choice during V(D)J recombination. **2022** doi: [10.3389/fgene.2021.823943](https://doi.org/10.3389/fgene.2021.823943)
- **Review Editor, B cell Biology, *Frontiers in Immunology* (2018-present; Public Reviewer below):**
 - Ovejero S, Viziteu E, Dutrieux L, Devin J, Lin YL, Alaterre A, Jourdan M, Basbous J, Requirand G, Roibert N, de Boussac H, Seckinger A, Hose D, Vincent L, Herbaux C, Constantinou A, Pasero P, Moreaux J. The BLM helicase is a new therapeutic target in multiple myeloma involved in replication stress survival and drug resistance. **2022** doi: [10.3389/fimmu.2022.983181](https://doi.org/10.3389/fimmu.2022.983181)
 - Corcoran AE, Rogers CH, Mielczarek O. Dynamic 3D locus organisation and its drivers underpin immunoglobulin recombination. 2020 doi: [10.3389/fimmu.2020.633705](https://doi.org/10.3389/fimmu.2020.633705)
 - Smith AL, Scott JNF, Boyes J. The ESC: The Dangerous By-Product of V(D)J. **2020** doi: [10.3389/fimmu.2019.01572](https://doi.org/10.3389/fimmu.2019.01572)
 - Safonova Y and Pevzner PA. De novo inference of diversity genes and analysis of non-canonical V(DD)J recombination in immunoglobulins. **2019** doi: [10.3389/fimmu.2019.00987](https://doi.org/10.3389/fimmu.2019.00987)

GRANT SUPPORT

Ongoing:

R37 CA266042 02/11/2022 – 01/31/2027

NIH/NCI (Pannunzio)

Role: Co-I

Title: Developing a Mechanistic Understanding of Genome Rearrangements in Ph-Like ALL to Determine Predictive Markers in High-Risk Hispanic Populations.

As Co-I, the major goal of this project is to identify recurrent DSBs in human pre-B cell lines as part of developing a diagnostic assay for Ph-like ALL.

RSG-23-1038994-01-DMC 07/01/2023 – 06/30/2027

American Cancer Society (Frock)

Role: PI

Title: Novel Regulators of DNA Repair and Recombination.

The major goals of this project are to elucidate *bona fide* alternative end joining and DNA damage response mechanisms.

Completed:

V Scholar V2019-003 11/01/2019 – 10/31/2021

V Foundation

Role: PI

Title: Mechanisms of double stranded DNA repair pathway choice in G1/G0-phase

The major goals of this project are to determine impact of core NHEJ deficiencies on A-EJ and V(D)J recombination in non-cycling progenitor B cells and to establish breast cancer cell lines for non-cycling DSB repair studies.

Career Development Award

5/1/2019 – 4/30/2020

Radiation Research Foundation

Role: PI

Studies to measure IR-generated DSBs in G1-arrested B cell progenitors and impact to DSB repair with IR dose-rate modulation.

SERVICE AS GRANT REVIEWER

07/2023	Ad hoc Reviewer, K99/R00 - ZGM1 TWD-8(KR), NIH/NIGMS
07/2022, 05/2018	Ad hoc Reviewer, Swiss National Science Foundation
10/2021	Early Career Reviewer, Molecular Genetics B Study Section, NIH/CSR
03/2019	Ad hoc Reviewer, Israel Science Foundation

SERVICE AS INVESTIGATOR REVIEWER

04/2022	Pasteur Institute, Paris, France
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PATENTS

“Methods relating to the detection of recurrent and non-specific double strand breaks in the genome” Alt FW, **Frock RL**, Hu J, Meyers RM WO2016081798, USPTO 15/527,790 Patent No.10640820 (5/5/2020).

UNIVERSITY ADMINISTRATIVE SERVICE

2024	Stanford Cancer Institute DNA repair faculty search committee member
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Service to the Department

PhD Thesis Committee

2020	Defense Chair, Tony Gao (Qi)
2019-2023	Member and Defense Chair, Maxim Markovic (Nolan)
2019	Defense Chair, Michael Debreuil (Bassik)
2019	Defense Chair, Zintis Inde (Dixon)

Department of Radiation Oncology Radical Seminar Speaker Series (Virtual)

2021-present	Speaker organizer and host
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SERVICE TO PROFESSIONAL ORGANIZATIONS

MEMBERSHIPS

- Radiation Research Society (2019-present)
- American Association for Cancer Research (2018-present)
- American Association for the Advancement of Science (2010-present)
- Society for Developmental Biology (2009-present)
- American Society for Cell Biology (2002-present)

COMMITTEE SERVICE

- [2nd Flash Radiotherapy and Particle Therapy Conference](#), November 30-December 2, 2022,

Curriculum Vitae: updated February 29, 2024 | Richard L. Frock
Barcelona, Spain—FLASH Mechanisms Track Session Chair.

- [FASEB SRC: Genetic Recombination and Genome Rearrangements Conference](#). **August 14-19, 2022**, Steamboat Springs, CO—Discussion Session Leader.
- [AACR Annual Meeting 2021](#). **April 9-14, 2021**, Virtual—Chair, DNA Damage and Repair Section, Molecular and Cellular Biology, Genetics Subcommittee.
- [Gordon Research Conference: DNA Damage, Mutation and Cancer](#). **March 1-6, 2020**, Ventura, CA—Academia Career Mentoring Dinner
- [FASEB SRC: Genetic Recombination and Genome Rearrangements Conference](#). **July 14-19, 2019**, Steamboat Springs, CO—Discussion Session Leader; Career Workshop Panelist
- [Northeast Regional Life Sciences Core Directors Meeting](#), **October 13-15, 2016**, Boston, MA—Breakout Session Organizer for CRISPR off-targets

CERTIFICATIONS

- MCHRI Eureka Translational Medicine, **February 9-13, 2020**, Monterey, CA

PRESENTATIONS

INVITED ORAL PRESENTATIONS (National and Regional; 29 total)

1. “FLASH Radiotherapy, DNA Damage and Translocations” John’s Hopkins University Grand Rounds: *Emerging Themes of Basic Cancer Biology Series*, Department of Radiation Oncology, **February 29, 2024**, Webinar
2. “Molecular Archaeology: Unraveling Principles of Chromosome Translocations” University of California, Irvine, Department of Biological Chemistry *BC Seminar Series*, **January 10, 2024**, Irvine, CA.
3. “Compounding V(D)J recombination reveals novel end joining functional determinants” [45th Chromatin Chromosomes and Epigenetics Conference](#). **December 7-10, 2023**, Asilomar, CA.
4. “Molecular Archaeology: unraveling principles of DNA end joining” University of Arkansas Medical Sciences, Biochemistry and Molecular Biology Faculty Seminar Series, **November 16, 2022**, Webinar.
5. “FLASH does not alter MH-mediated repair under varying O₂ tension vs. CONV dose rates” [68th Annual Radiation Research Society Meeting](#). **October 16-19, 2022**, Waikoloa Village, HI.
6. “Cutting and pasting: DNA repair artistry in non-cycling cells” Stanford Bio-X Undergraduate Summer Research Program Faculty Talk, **July 20, 2022**, Stanford, CA.
7. “Cutting and pasting: DNA repair artistry in non-cycling cells” University of the Pacific Biological Sciences Seminar, **April 8, 2022**, Stockton, CA.
8. “Aberrant DNA end joining mechanisms in non-cycling cells.” Stanford Radiation Oncology Department Retreat, **November 18-19, 2021**, Stanford, CA.
9. “DNA end joining in quiescent progenitor B cells.” University of California, Davis, Seminar in Molecular Genetics. **November 15, 2021**, Davis CA.
10. “Functional genomics of DNA repair processes.” 44th Annual Stanford Cancer Biology Program Scientific Conference, **November 12-13, 2021**, Woodside, CA.
11. “Identifying the rules of engagement: DNA end-joining in G1/G0-phase.” Stanford Radiation Oncology Faculty Seminar Series, **February 5, 2021**, Stanford, CA.
12. “Mind the Gap: Breaking new ground on G1-phase end-joining.” Tulane University, Department of Biochemistry and Molecular Biology Seminar Series. **April 20, 2020**, Webinar.
13. “Repair Fate Mapping of Broken Ends in Non-Dividing Cells.” [Gordon Research Conference: DNA Damage, Mutation and Cancer](#). **March 1-6, 2020**, Ventura, CA.

14. “Elucidating DNA DSB repair pathway choice in G1-phase progenitor B cells.” [65th Annual Radiation Research Society Meeting](#), **November 3-6, 2019**, San Diego, CA.
15. “Elucidating mechanisms of chromosome translocations and double strand break repair.” 41st Annual Stanford Cancer Biology Program Scientific Conference, **September 14-15, 2018**, San Jose, CA.
16. “New Insights into Non-Homologous End-Joining Mechanisms of Recurrent DNA Double-Stranded Breaks in Progenitor B cells.” [2nd Annual Genome Editing USA Congress](#), **May 10-11, 2018**, Boston, MA.
17. “Assessing Endonuclease Off-Target Activity and Genome-wide Collateral Damage.” [Northeast Regional Life Sciences Core Directors Meeting](#), **October 13-15, 2016**, Boston, MA.
18. “Breaking Bad: Genome-wide Detection of Designer Nuclease Targeting and its Ensuing Collateral Damage.” [Precision Medicine Symposia-2016 on RNAi/Genome Editing](#), **May 4-5, 2016**, Burlington, MA.
19. “Breaking Bad: Genome-wide Detection of Designer Nuclease Targeting and its Ensuing Collateral Damage.” [Clinical Immunology Society Annual Meeting](#), **April 14-17, 2016**, Boston, MA.
20. “Genome-wide Detection of DNA Double-Stranded Breaks Induced by Engineered Nucleases.” [Information Gathering Meeting on Human Editing](#), **October 5, 2015**, National Academy of Sciences, Washington, D.C.
21. “Genome-wide Detection of DNA Double-stranded Breaks Induced by Engineered Nucleases.” [HHMI Scientific Meeting](#), **February 10-12, 2015**, Chevy Chase, MD.
22. “Genome-wide Detection of DNA Double-Stranded Breaks Induced by Engineered Nucleases.” [Genome Engineering: The CRISPR/Cas Revolution](#), **September 24-27, 2015**, Cold Spring Harbor, NY.
23. “Genome-wide Assessment of Custom Nuclease-mediated On and Off-target Breaks and Translocations in Human Cells.” Harvard Medical School, Division of Immunology Trainee Forum, **April 11, 2014**, Boston, MA.
24. “Principles of Translocations in Human Cells Using Engineered Nucleases Targeting the RAG1 Locus.” Harvard Medical School, DNA Replication and Repair Series, **August 1, 2013**, Boston, MA.
25. “Principles of Translocations in Human Cells Using Engineered Nucleases Targeting the RAG1 Locus.” Boston Children’s Hospital Program in Cellular and Molecular Medicine Open Forums, **March 22, 2013**, Boston, MA.
26. “Genome-wide Translocation Sequencing Reveals Mechanisms of Chromosome Breaks and Rearrangements in B cells.” *4th Annual Northwest Genome Engineering Consortium workshop on Genome Engineering*, **Nov 8, 2011**, Seattle, WA.
27. “Elucidating the Mouse B Lymphocyte Translocatome.” Harvard Medical School Immune Disease Institute Open Forums, **March 18, 2011**, Boston, MA.
28. “Delayed Muscle Differentiation Kinetics in *Lmna*^{-/-} Myoblasts.” *3rd Seattle Muscular Dystrophy Conference*, **June 14-15, 2007**, Seattle, WA.
29. “Lamin A/C and Emerin are Critical for Normal Adult Skeletal Myogenesis.” *Northwest Developmental Biology Conference*, **March 16-19, 2005**, Friday Harbor, WA.

INVITED ORAL PRESENTATIONS (International; 6 total)

1. “DNA-PKcs Suppresses Illegitimate Chromosome Rearrangements” [NHEJ in Health and Diseases](#), **September 27-29, 2023**, Institute for Radiation Protection and Nuclear Safety (IRSN), Fontenay-aux-Roses, France

2. “Molecular archaeology: unraveling principles of chromosome translocations” Institute of Biology de l’École Normale Supérieure (IBENS), **June 20, 2023**, Paris, France
3. “FLASH does not alter MH-mediated repair under varying O₂ tension vs. CONV dose rates” [2nd Flash Radiotherapy and Particle Therapy Conference](#), **November 30-December 2, 2022**, Barcelona, Spain.
4. “High-Throughput Methods to Study V(D)J Recombination, IgH Class Switch Recombination, Chromosomal Translocations, and DNA End-Joining” 19th International Summer School on Immunology - FEBS advanced lecture course Immune System: Genes, Receptors and Regulation, **September 23-30, 2017**, Hvar Island, Croatia.
5. “Genome-wide Analysis of Designer Nuclease Targeting” 9th Stem Cell Clonality and Genome Stability Retreat, **October 17-18, 2016**, Florence, Italy.
6. “Gene Editing Tools and Assessing their Genome-wide Collateral Damage” Precision Genome Engineering Training Day, **January 27, 2016**, Ghent, Belgium.

CONFERENCE PRESENTATIONS (Poster; 13 total)

1. Barghouth PG, Melemenidis S, Montay-Gruel P, Ollivier J, Viswanathan V, Gonçalves PJ, Soto LA, Lau BC, Sadeghi C, Edlabadkar A, Manjappa R, Wang J, Le Bouteiller M, Surucu M, Yu A, Bush K, Skinner L, Maxim P, Loo Jr. BW, Limoli C, Vozenin M-C, Frock RL. FLASH-RT does not affect chromosome translocations and junction structures beyond that of CONV-RT dose-rates. [International Wolfsberg Meeting on Molecular Radiation Biology/Oncology](#). **June 17-19, 2023**, Hurdalsjøen Hotel, Norway.
2. Wang JL, Le Bouteiller M, Origel CA, Sadeghi C, Conner KA, Le L, Edlabadkar A, **Frock RL**. Compounding V(D)J recombination reveals novel end joining functional determinants. [Fusion: Balancing Genome Fidelity and Plasticity Conference](#). **May 4-7, 2023**, Tulum, Mexico.
3. Wang JL, Origel C, Le Bouteiller M, Sadeghi C, Conner KA, Le L, Edlabadkar, A, **Frock RL**. Identifying DNA end-joining functional determinants in non-cycling progenitor B cells. [FASEB SRC: Genetic Recombination and Genome Rearrangements Conference](#). **August 14-19, 2022**, Steamboat Springs, CO.
4. Wang JL, Sadeghi C, Xu J, Meng J, **Frock RL**. Characterizing compounds and genes in V(D)J recombination. Stanford Radiation Oncology Department Retreat **November 18-19, 2021**, Stanford, CA.
5. Wang JL, Le Bouteiller M, Origel CA, Barghouth PG, Sadeghi C, Meng J, **Frock RL**. DNA end joining in quiescent progenitor B cells. Poster. [Gordon Research Conference: Mammalian DNA Repair](#), **October 31-November 5, 2021**, Ventura, CA.
6. Liang Z, Kumar V, Le Bouteiller M, Zurita J, Kenrick J, Lin SG, Lou J, Hu J, Ye AY, Boboila C, Alt FW, **Frock RL**. Ku70 suppresses alternative end joining in G1-arrested B cells. [Virtual iPoster. 2021 V Scholar Summit](#). **April 28-29, 2021**.
7. **Frock RL**, Kumar V, Liang Z, Zurita J, Du Z, Lin SG, Boboila C, Alt FW. Ku70 Suppresses Alternative End-joining in G1-arrested progenitor B cells. [Gordon Research Conference: DNA Damage, Mutation and Cancer](#). **March 1-6, 2020**, Ventura, CA.
8. **Frock RL**, Kumar V, Liang Z, Zurita J, Du Z, Lin SG, Boboila C, Alt FW. Ku70 Suppresses Alternative End-joining in G1-arrested progenitor B cells. [Translational Oncology Program Annual Symposium](#). **October 21, 2019**, Stanford, CA.
9. **Frock RL**, Kumar V, Liang Z, Zurita J, Du Z, Lin SG, Boboila C, Alt FW. Ku70 Suppresses Alternative End-joining in G1-arrested progenitor B cells. [FASEB SRC: Genetic Recombination and Genome Rearrangements Conference](#). **July 14-19, 2019**, Steamboat Springs, CO.

10. **Frock RL**, Kumar V, Liang Z, Zurita J, Du Z, Lin SG, Boboila C, Alt FW. Ku70 Suppresses Alternative End-joining in G1-arrested progenitor B cells. [*Gordon Research Conference: Mammalian DNA Repair*](#). **February 10-15, 2019**, Ventura, CA.
11. **Frock RL**, Kumar V, Liang Z, Zurita J, Du Z, Lin SG, Boboila C, Alt FW. Ku70 Suppresses Alternative End-joining in G1-arrested progenitor B cells. Stanford Immunology Annual Scientific Conference. **November 2-4, 2018**, Pacific Grove, CA.
12. **Frock RL**, Kumar V, Liang Z, Zurita J, Du Z, Lin SG, Boboila C, Alt FW. Ku70 Suppresses Alternative End-joining in G1-arrested progenitor B cells. [*Genome Engineering: The CRISPR-Cas Revolution*](#). **August 22-25, 2018**, Cold Spring Harbor, NY.
13. **Frock RL**, Kumar V, Liang Z, Zurita J, Du Z, Lin SG, Boboila C, Alt FW. Ku70 Suppresses Alternative End-joining in G1-arrested progenitor B cells. [*Gene Expression and Signaling in the Immune System*](#). **April 24-28, 2018**, Cold Spring Harbor, NY.

TEACHING

Fall 2021-2023	Lecturer Stanford University, C BIO 240: Molecular and Genetic Basis of Cancer Role: Lecture on DNA end joining mechanisms and chromosome translocations, V(D)J recombination and hematologic malignancies.
Spring 2019-2024	Lecturer Stanford University, RADO 202: The Basic Science of Radiation and Cancer Biology Role: Single lecture on the DNA damage response, DNA repair pathways, and Genome Instability Syndromes for medical students.
Fall 2018-2020, 2022	Lecturer Stanford University, C BIO 280: Cancer Biology Journal Club Role: Lecture on chromosome translocations, DNA repair outcomes and other laboratory research topics.
Fall 2018 Winter 2024	Discussion Section Leader Stanford University, C BIO 240/280: Cancer Biology Journal Club Role: Facilitated journal club style discussions on papers related to the lecturer's weekly topic for graduate students
Sept. 2017	Lecturer , FEBS International Summer School on Immunology, Hvar Island, Croatia
Spring 2003	Teaching Assistant , Univ. Washington, BIOC 442: Molecular and Cellular Biology
Winter 2003	Teaching Assistant , Univ. Washington, HUBIO 524: Biochemistry and Metabolism
Fall 2002	Teaching Assistant , Univ. Washington, BIOC 426: Basic Techniques in Biochemistry
Spring 1999	Teaching Assistant , Vassar College, CHEM 245: Organic Chemistry Laboratory
Spring 1998	Teaching Assistant , Vassar College, CHEM 110/111: General Chemistry Laboratory

MENTORING (PI)

Postdoctoral Fellows:

- Jinglong Wang (2020-present) –Postdoctoral Scholar, Stanford University, Stanford, CA
- Carlos Origel (2020-2021) –Postdoctoral Fellow, Oregon Health & Science University, Portland, OR
- Marie Le Bouteiller (2019-2021) –Homemaker
- Paul Barghouth (2019-2021) –Researcher, Nucleix, San Diego, CA

Master/Doctoral/Medical/Veterinary Students:

- Kristin Conner (2022) – Veterinary Student, UC Davis, CA
- Cheyenne Sadeghi (2021-present) – Master Student, Stanford University, Stanford, CA

Research Technicians/Bioinformaticians:

- Josefin Kenrick (2018-2021) –PhD student, Royal Institute of Technology, Stockholm, Sweden
- Micah Kelly (2018-2019) –Admin. Associate, Radiation Oncology, Stanford University Stanford, CA

Undergraduate Research Students:

- Elvis Lang (2023) – Undergraduate, Case Western Reserve, Cleveland, OH
- Darsh Vithlani (2023) – Undergraduate, Institute of Chemical Technology, Mumbai, India
- Anushka Edlabadkar (2022) – Undergraduate, UC San Diego, CA
- Long Le (2022) – Researcher, Cypre, South San Francisco, CA
- Jodie Meng (2021-2022) – Undergraduate, Stanford University, Stanford, CA
- Anita Taft (2021) – Undergraduate, Stanford University, Stanford, CA

High School Summer Students:

- Carrie Truong (2023) – High school student, St. Joseph Notre Dame, Oakland, CA
- Finn Maniscalco (2019) –Undergraduate, University of Pennsylvania, Philadelphia, PA

MENTORING (PhD/postdoc)

Postdoctoral Fellows:

- Zhuoyi Liang (HMS) (2017-2021) – Assistant Professor, Hong Kong University of Science and Technology – HKUST(GZ), Hong Kong, China

Doctoral Students:

- Steven Chen (UW) (2007-2010) –Staff Scientist, Fred Hutchinson Cancer Research Center, Seattle, WA

Research Technicians/Bioinformaticians:

- Jeffrey Zurita (HMS) (2016-2017) –Research Engineer, ReFed, Long Island City, NY
- Robin Meyers (HMS) (2013-2015) –PhD student, Stanford University, Stanford, CA
- Yu-Jui Ho (HMS) (2010-2013) –Computational Biologist, Memorial Sloan Kettering Cancer Center, New York, NY
- Diana Pak (UW) (2007-2009) –Clinical Pharmacist, Virginia Mason Medical Center, Seattle, WA

Undergraduate Research Students:

- Erina Kii (HMS/Vassar) (2013) –Software Engineer II, Wayfair, Boston, MA
- Carmen Lau (UW) (2008-2009) –BMT Clinical Pharmacy Specialist, Memorial Sloan Kettering Cancer Center, New York, NY
- Christina Brown (UW) (2008-2009) –Public Health Project Manager, Multnomah County, Portland, OR
- Sara Mamman (UW) (2007-2009) –Epic Ambulatory Analyst, John’s Hopkins Medicine, Baltimore, MD
- Ahmad Zebari (UW) (2007-2008) –Research Manager, Fred Hutchinson Cancer Research Center, Seattle, WA
- Joyce Jew (UW) (2005-2006) –Clinical Pharmacist, University of Washington, Seattle, WA
- Angela Tsai (Evans)(UW) (2004-2006) –Registered Dietitian, Veterans Affairs, Seattle, WA