Donald Philip Breakwell, Ph.D.

Teaching Professor
Department of Microbiology and Molecular Biology
Brigham Young University
2060G LSB
Provo, UT 84602
Telephone (801) 378-2378
Email: breakwell@byu.edu

Education

Doctor of Philosophy, August 1992, Purdue University
Master of Science, August 1988, Purdue University
Bachelor of Science, August 1986, Brigham Young University

Employment History

2015-2025	Assistant Dean, Director of Student Services, College of Life Sciences, Brigham Young University
2022-present	Adjunct Professor, Roseman University of Health Sciences, School of Dentistry
2010-present	Teaching Professor, Brigham Young University
2001-2010	Associate Teaching Professor, Brigham Young University; continuing faculty status granted, 2008
2000-2001	Temporary Associate Teaching Professor, Brigham Young University
1996-2000	Associate Professor, Snow College; tenure granted, 1996
1992-1996	Assistant Professor, Snow College
1992	Research Assistant, Michigan State University

Honors and Awards

Karl G. Maeser Professional Faculty Excellence Award, 2025, Brigham Young University
Technology Transfer Award, 2016, Brigham Young University
Karl G. Maeser Professional Faculty Excellence Award, 2015, Brigham Young University
College of Life Sciences Teaching Excellence Award, 2008, Brigham Young University
Alcuin Fellowship in General Education, 2003-2006, Brigham Young University

Professional Service

American Society for Microbiology 2009-2012, Editorial Board, Journal of Microbiology and Biology Education.
American Society for Microbiology 2008-2009, Chair of Steering Committee, American Society for Microbiology Conference for Undergraduate Educators.
American Society for Microbiology 2008-2010, Member, Committee on Undergraduate Education
American Society for Microbiology Co-Chair, 13th Annual American Society for Microbiology Conference for Undergraduate Educators. Orlando, FL. May 19-21, 2006.
American Society for Microbiology Session Chair, 2010, Intermountain Branch Meeting, Provo, UT.

Publications (since 2011; undergraduate co-authors underlined)

1. Bogh A, Gwilliam J, Mourik P, Scott JD, Jackson M, Moffat RE, Domike MD, Larson AR, Higgins G, Danielson PC, et al. 2025. Genome sequence of cluster B1 Mycobacterium smegmatis phages Thunderbird, Gwilliam, and Jiraiya. Microbial Resource Announcements https://doi.org/10.1128/mra.00393-25
2. Payne S, Longhurst J, Lazaro EC, Jackson M, Scott J, Daines SB, Brink CB, Chamberlain H, Gwilliam JD, Higgins G, et al. 2025. Genome sequences of four A1 subcluster Mycobacterium smegmatis bacteriophages. Microbial Resource Announcements. https://doi.org/10.1128/mra.01331-24
3. Jackson MN, Hwang H, Danielson PC, Walborn E, Longhurst J, Oostendorp BV, Harrell CC, Olsen NA, Johnson AM, Danielson P, et al. 2025. Genome sequence of cluster F1 Mycobacterium smegmatis phage Fastidio. Microbiology Resource Announcements. 14(4):3.
4. Radke K, Peless H, Chamberlain H, Aggabao S, Ridd R, Amsbury D, Cannon J, Fisher T, Danielson P, Jackson M, et al. 2025. Genome Sequence of Cluster A6 Bacteriophage Lilbunny, Isolated Using Mycobacterium smegmatis mc2155. Microbial Resource Announcements. https://doi.org/10.1128/mra.01327-24
5. Aggabao SM, Hassell R, Leary BS, Bautista SI, Chamberlain HH, Radke K, Peless HM et al. 2025. Complete genome sequences of *Mycobacterium smegmatis* mc^{2}155 cluster E bacteriophages Policronamos and Palpatine. Microbiology Resource Announcements. https://doi.org/10.1128/mra.00392-25

6. Hanauer, D., Alvey, R., (...)**Breakwell, D.P.**(...)Hatfull, G., Heller, D., Jacobs-Sera, D., Monti, D., Ramakrishna, P., Russell, D., Sivanathan, V. 2024. The professional identity of STEM faculty as instructors of course-based research experiences. Frontiers in Education. DOI: http://doi.org/10.3389/feduc.2024.1442306
7. Radke, J; Ochoa-Repåraz, J; (...)**Breakwell, D.P.**(...) Pickett, BE. 2024. A summary of the main themes and findings presented at the ASM Intermountain Branch meeting (2024). Msphere. DOI: http://doi.org/10.1128/msphere.00481-24
8. Hyde. J.R., Armond, T., Herring, J.A., Hope, S., Grose, J.H., **Breakwell, D.P**., Pickett, B.E. 2023. Diversity and conservation of the genome architecture of phages infecting the Alphaproteobacteria. Microbiology Spectrum DOI: https://doi.org/10.1128/spectrum.02827-23
9. Meadows,H.N., Fisher,J.N.B., Gardner,A.V., Merrill,B.D., Hartmann,K.A., Bailey,M.E., Beckstead,A.P., Deus,L.M., Earl,A.S., Easter,R.A., Gibby,P.D., Graves,K.A., Ayer,P.A., Heiner,M.E., Herring,J.A., Jaen,A.D., Liu,J.E., Manci,A.M., Nielsen,D.A., Paz,H.C., Sabin,N.R., Solomon,M.B., Sutter,R.A., Wake,B.N., Willyerd,H.J., Zimmerman,L.J., **Breakwell,D.P**., Burnett,S.H., Grose,J.H., Bradley,K.W., Clarke,D.Q., Lewis,M.F., Barker,L.P., Bailey,C., Asai,D.J., Garber,M.L., Bowman,C.A., Russell,D.A., Pope,W.H., Jacobs-Sera,D., Hendrix,R.W. and Hatfull,G.F. Mycobacterium phage Phantastic, complete genome. NC_024148
10. Brady ST, Roll CR, Walker JK, Fajardo CP, **Breakwell DP**, Eggett DE, and Hope S. 2021. Phages Bind to Vegetative and Spore Forms of *Paenibacillus larvae* and to Vegetative *Brevibacillus laterosporus*. *Front. Microbiol*., 10.3389/fmicb.2021.588035
11. Sharma R, Berg JA, Beatty NJ, Choi MC, Cowger AE, Cozzens BJR, Duncan SG, Fajardo CP, Ferguson HP, Galbraith T, Herring JA, Hoj TR, Durrant JL, Hyde JR, Jensen GL, Ke SY, Killpack S, Kruger JL, Lawrence EEK, Nwosu IO, Tam TC, Thompson DW, Tueller JA, Ward MEH, Webb CJ, Wood ME, Yeates EL, Baltrus DA, **Breakwell DP**, Hope S, Grose JH. Genome Sequences of Nine Erwinia amylovora Bacteriophages. Microbiol Resour Announc. 2018 Oct 11;7(14). pii: e00944-18. doi: 10.1128/MRA.00944-18.
12. Merrill BD, Fajardo CP, Hilton JA, Payne AM, Ward AT, Walker JK, Dhalai A, Imahara C, Mangohig J, Monk J, Pascacio C, Rai P, Salisbury A, Velez K, Bloomfield TJ, Buhler B, Duncan SG, Fuhriman DA, George J, Graves K, Heaton K, Hill HL, Kim M, Knabe BK, Ririe DB, Rogers SL, Stamereilers C, Stephenson MB, Usher BK, Ward CS, Withers JM, Wright CK, **Breakwell DP**, Grose JH, Hope S, Tsourkas PK. 2018. Complete Genome Sequences of 18 Paenibacillus larvae Phages from the Western United States. Microbiol Resour Announc. 2018 Oct 4;7(13). pii: e00966-18. doi: 10.1128/MRA.00966-18.
13. Weber KS, Bridgewater LC, Jensen JL, **Breakwell DP**, Nielsen B, Johnson SM. 2018. Personal microbiome analysis improves student engagement and interest in Immunology, Molecular Biology, and Genomics undergraduate courses. PLoS One. 13(4):20 pages. doi:10.1071/FP17281
14. Walker JK, Merrill BD, Berg JA, Dhalai A, Dingman DW, Fajardo CP, Graves K, Hill HL, Hilton JA, Imahara C, Knabe BK, Monk J, Mun H, Payne AM, Salisbury A, Stamereilers, C, Velez K, Ward AT, **Breakwell DP**, Grose JH, Hope S, Tsourkas PK. (2018) Complete Genome Sequences of Paenibacillus larvae Phages BN12, Dragolier, Kiel007, Leyra, Likha, Pagassa, PBL1c and Tadhana. Genome Announc. 2018. 6(24) pii: e01602-17.
15. Berg JA, Merrill BD, **Breakwell DP**, Hope S, Grose JH. (2018) A PCR-Based Method for Distinguishing between Two Common Beehive Bacteria, Paenibacillus larvae and Brevibacillus laterosporus. Appl. Environ. Microbiol. DOI: 10.1128/AEM.01886-18.
16. David I. Hanauer, Mark J. Graham, SEA-PHAGES, Laura Betancur, Aiyana Bobrownicki, Steven G. Cresawn, Rebecca A. Garlena, Deborah Jacobs-Sera, Nancy Kaufmann, Welkin H. Pope, Daniel A. Russell, William R. Jacobs, Jr., Viknesh Sivanathan, David J. Asai, and Graham F. Hatfull. 2017. An inclusive Research Education Community (iREC): Impact of the SEA-PHAGES program on research outcomes and student learning. *Proceedings of the National Academy of Sciences.* 114 (51) 13531-13536; published ahead of print December 5, 2017, doi:10.1073/pnas.1718188115.
17. Esplin IND, Berg JA, Sharma R, Allen RC, Arens DK, Ashcroft CR, Bairett SR, Beatty NJ, Bickmore M, Bloomfield TJ, Brady TS, Bybee RN, Carter JL, Choi MC, Duncan S, Fajardo CP, Foy BB, Fuhriman DA, Gibby PD, Grossarth SE, Harbaugh K, Harris N, Hilton JA, Hurst E, Hyde JR, Ingersoll K, Jacobson CM, James BD, Jarvis TM, Jaen-Anieves D, Jensen GL, Knabe BK, Kruger JL, Merrill BD, Pape JA, Payne Anderson AM, Payne DE, Peck MD, Pollock SV, Putnam MJ, Ransom EK, Ririe DB, Robinson DM, Rogers SL, Russell KA, Schoenhals JE, Shurtleff CA, Simister AR, Smith HG, Stephenson MB, Staley LA, Stettler JM, Stratton ML, Tateoka OB, Tatlow PJ, Taylor AS, Thompson SE, Townsend MH, Thurgood TL, Usher BK, Whitley KV, Ward AT, Ward MEH, Webb CJ, Wienclaw TM, Williamson TL, Wells MJ, Wright CK, **Breakwell DP**, Hope S, Grose JH. (2017) Genome Sequences of 19 Novel Erwinia amylovora Bacteriophages. *Genome Announc.* 2017 Nov 16;5(46). pii: e00931-17. doi: 10.1128/genomeA.00931-17.
18. Aanderud ZT, Vert JC, Lennon JT, Magnusson TW, **Breakwell DP**, and Harker AR. (2016) Bacterial Dormancy Is More Prevalent in Freshwater than Hypersaline Lakes. *Front. Microbiol*., 09 June 2016 | https://doi.org/10.3389/fmicb.2016.008.
19. Berg JA, Merrill BD, Crockett JT, Esplin KP, Evans, MR, Heaton KE, Hilton, JA, Hyde JR, McBride MS,

Schouten JT, Simister AR, Thurgood TL, Ward AT, **Breakwell DP**, Hope SH, Grose JH (2016). Characterization of Five Novel *Brevibacillus* Bacteriophages and Genomic Comparison of *Brevibacillus* Phages. *PLoS One* 0.1371/journal.pone.0156838

20. Merrill BD, Berg JA, Graves KA, Ward AT, Hilton JA, Wake BN, Grose JH, **Breakwell DP**, Burnett SH. (2015) Genome Sequences of Five Additional *Brevibacillus laterosporus* Bacteriophages. *Genome Announc.* doi: 10.1128/genomeA.01146-15
21. Pope WH, Bowman CA, Russell DA, Jacobs-Sera D, Asai DJ, Cresawn SG, Jacobs WR, Hendrix RW, Lawrence JG, Hatfull GF; Science Education Alliance Phage Hunters Advancing Genomics and Evolutionary Science; Phage Hunters Integrating Research and Education; Mycobacterial Genetics Course.(2015) Whole genome comparison of a large collection of mycobacteriophages reveals a continuum of phage genetic diversity. Elife. 2015 Apr 28;4:e06416. doi: 10.7554/eLife.06416.
22. Grose JH, Jensen GL, Burnett SH, and **Breakwell DP**. (2014) Genomic Comparison of 93 Bacillus Phages Reveals 12 Clusters, 13 Singletons, and Remarkable Diversity. *BMC Genomics* 15(1): 855
23. Merrill BD, Grose JH, **Breakwell DP**, and Burnett SH. (2014) Characterization of *Paenibacillus larvae* bacteriophages and their genomic relationships to Firmicute bacteriophages. *BMC Genomics* 15(1): 745.
24. Grose, JH, Belnap DM, Jensen JD, Mathis AD, Prince JT, Burnett SH, and **Breakwell DP**. (2014) The Genomes, Proteomes and Structure of Three Novel Phages that Infect the *Bacillus cereus* Group and Carry Putative Virulence Factors. Journal of Virology 80(20): 11846
25. Tazi L, **Breakwell DP**, Harker AR, and Crandall, KA. (2014) Life in extreme environments: microbial diversity in Great Salt Lake, Utah. Extremophiles 18(3): 525-535.
26. Grose JH, Jensen JD, Merrill BD, Fisher JNB, Burnett SH, and **Breakwell DP.** (2014) The Genomes of Three Novel Bacillus cereus Bacteriophages. *Genome Announc.* Jan/Feb 2014 (2)1: doi:10.1128/genomeA.01118-13.
27. Graham F. Hatfull, Science Education Alliance Phage Hunters Advancing Genomics and Evolutionary Science (SEA-PHAGES) Program, KwaZulu-Natal Research Institute for Tuberculosis and HIV (K-RITH) Mycobacterial Genetics Course, University of California—Los Angeles Research Immersion Laboratory in Virology, Phage Hunters Integrating Research and Education (PHIRE) Program (2013) Complete Genome Sequences of 63 Mycobacteriophages. *Genome Announc.* Nov./Dec. 2013; 1:doi:10.1128/ genomeA. 00847-13.
28. **Breakwell DP**, Barrus EZ, Benedict AB, Brighton AK, Fisher JNB, Gardner AV, Kartchner BJ, Ladle KC, Lunt BL, Merrill BD, Morrell JD, Burnett SH, Grose JH (2013) Genome Sequences of Five B1 Subcluster Mycobacteriophages *Genome Announc.* Nov/Dec 2013 1:e00968-13; doi:10.1128/genomeA.00968-13.
29. Sheflo MA, Gardner AV, Merrill BD, Fisher JNB, Lunt BL, **Breakwell DP**, Grose JH, Burnett SH (2013) Complete Genome Sequences of Five Paenibacillus larvae Bacteriophages. *Genome Announc.* Nov/Dec 2013 1:e00668-13; doi:10.1128/genomeA.00668-13.
30. Smith KC, Castro-Nallar E, Fisher JNB, **Breakwell DP**, Grose JH, Burnett SH (2013) Phage cluster relationships identified through single gene analysis. *BMC Genomics* 14:410.
31. P.S. Shen, M. J. Domek, E. Sanz-García, A. Makaju, R. M. Taylor, R. Hoggan,M. D. Culumber, C. J. Oberg, **D. P. Breakwell**, J. T. Prince, and D. M. Belnap. 2012. Sequence and Structural Characterization of Great Salt Lake Bacteriophage CW02, a Member of the T7-Like Supergroup. J. Virol. 86:15 7907-7917
32. Graham F. Hatfull, the Science Education Alliance Phage Hunters Advancing Genomics and Evolutionary Science Program, the KwaZulu-Natal Research Institute for Tuberculosis and HIV Mycobacterial Genetics Course Students and the Phage Hunters Integrating Research and Education Program. 2012. Complete Genome Sequences of 138 Mycobacteriophages. J. Virol. 86:2382-2384
33. Jordon K. March, Kyle C. Jensen, Nathan T. Porter, and **Donald P. Breakwell**. 2011. Authentic Active Learning Activities Demonstrating the Use of Serial Dilutions and Plate Counts. Journal of Microbiology and Biology Education 12: 152-156.

Presentations (since 2010)

1. Van Oostendorp B†, Harrell CC†, Johnson AM†, Longhurst JS†, Danielson PC†, Olsen NA†, Berquist JT†, Stohl TD†, Tower SP†, Breakwell DP, Pickett BE. Bigger, Phatter, More Audacious Phage Project. American Society for Microbiology Intermountain Branch Annual Meeting. Pocatello, ID. April, 2025.
2. O'Keefe BE†, Hunsaker ZM†, Huff AJ†, Johnson AM†, Danielson PC, † Longhurst JS†, Olsen NA†, Harrell CC†, Van Oostendorp B†, Breakwell DP, Pickett BE. Characterizing Two E Cluster Phages with Putative Proteins. American Society for Microbiology Intermountain Branch Annual Meeting. Pocatello, ID. April, 2025.
3. Ayedelotte LF†, Barton K†, Bunkall LT†, Chase BN†, Hillman MR†, McGuire EN†, Lyons L†, Reall ME†, Danielson PC†, Harrell CC†, Johnson AM†, Longhurst JS†, Olsen NA†, Van Oostendorp B†, Breakwell DP, Pickett BE. Genomic Variation Among Five A1 Subcluster Phages. American Society for Microbiology Intermountain Branch Annual Meeting. Pocatello, ID. April, 2025.

4. Williams JW†, Waid BB†, Hemmert DA†, Harris JR II†, Danielson PC†, Harrell CC†, Johnson AM†, Longhurst JS†, Olsen NA†, Van Oostendorp B†, Breakwell DP, Pickett BE. American Society for Microbiology Intermountain Branch Annual Meeting. Pocatello, ID. April, 2025.
5. Jeppson AL†, Danielson PC†, Harrell CC†, Johnson AM†, Longhurst JS†, Olsen NA†, Van Oostendorp B†, Breakwell DP, Pickett BE. Comparative genomic analysis of F2 subcluster bacteriophages including recently isolated *SilverChicken.* American Society for Microbiology Intermountain Branch Annual Meeting. Pocatello, ID. April, 2025.
6. Jackson I, Danielson PC†, Harrell CC†, Johnson AM†, Longhurst JS†, Olsen NA†, Van Oostendorp B†, Breakwell DP, Pickett BE. Caught in 4K: The Characterization of phage Bobqeusha. American Society for Microbiology Intermountain Branch Annual Meeting. Pocatello, ID. April, 2025.
7. Barton K, Burrows A, Guinn CR, Harkness JK, Howard MH, Jenson EA, McGuire EN, Danielson PC†, Harrell CC†, Johnson AM†, Longhurst JS†, Olsen NA†, Van Oostendorp B†, Breakwell DP, Pickett BE. Phormula Phage: The Race to Unravel the F1 Subcluster. American Society for Microbiology Intermountain Branch Annual Meeting. Pocatello, ID. April, 2025.
8. Walbom EW, Danielson PC, Pearson L., Bautista SI, Amsbury C, Hwang H, Harrell CC, Johnson AM, Olsen, NA, Van Oostendorp B, Wilhite TJ, Avery SW, Schachterle JK, Breakwell DP, Pickett BE. Three Novel F1 Subcluster Mycobacteriophages. 2024 ASM Intermountain Branch Meeting, Provo, UT.
9. Ridd RT, Fisher TG, East MJ, Cannon JR, Amsbury C, Danielson PC, Harrell CC, Johnson AM, Olsen, NA, Van Oostendorp B, Wilhite TJ, Avery SW, Schachterle JK, Breakwell DP, Pickett BE Lilbunny - A Siphovirus Isolated from Compost Containing Rabbit Manure. 2024 ASM Intermountain Branch Meeting, Provo, UT.
10. Olsen, NA, Harrell CC, Johnson AM, Van Oostendorp B, Wilhite TJ, Danielson PC, Avery SW, Schachterle JK, Breakwell DP, Pickett BE. The Big Phat Audacious Phage Project. 2024 ASM Intermountain Branch Meeting, Provo, UT.
11. Hassell RE, Leary BS, Aggabao SM, Bautista, SI, Danielson PC, Harrell CC, Johnson AM, Olsen, NA, Van Oostendorp B, Wilhite TJ, Danielson PC, Avery SW, Schachterle JK, Breakwell DP, Pickett BE. Three E Cluster Phages Containing Novel Putative Proteins. 2024 ASM Intermountain Branch Meeting, Provo, UT.
12. Payne ST, Daines SB, Brink CB, Chamberlain HH, Jackson MN, Longhurst JS, Scott JD, Gwilliam JD, Higgins G, Domike MD, Moffat RE, Larson AR, Harrell CC, Johnson AM, Olsen, NA, Van Oostendorp B, Wilhite TJ, Danielson PC, Avery SW, Schachterle JK, Breakwell DP, Pickett BE . Comparative Genomics of Four Novel A1 Subcluster Mycobacterium Phages. 2024 ASM Intermountain Branch Meeting, Provo, UT.
13. Power A, Naylor F, Cavalcante G, Townsend H, Cabezas M, Johnson AM, Wilhite TJ, Harrell JR, Harrell CC, Pang DT, Grose JH, Breakwell DP, Pickett. BE. A Comparative Genomic Analysis of the *Microbacterium foliorum* bacteriophage EG cluster. 2023 ASM Intermountain Branch Meeting, Provo, UT.
14. Cherry, AC, Menedez, SL, Huang, CF, Nelson, PL, Johnson AM, Wilhite TJ, Harrell JR, Harrell CC, Pang DT, Grose JH, Breakwell DP, Pickett. BE. Two Novel Genes in the Genome of Microbacterium foliorum phage Pasicarious. 2023 ASM Intermountain Branch Meeting, Provo, UT.
15. Van Oostendorp, B., Elison, B. Johnson AM, Harrrell, CC., Roylance, L, Rawlins, J., Campbell, C., Wilhite TJ, Harrell JR, Pang DT, Breakwell DP, Grose JH, Pickett. BE. Bacteriophage Parsicarious: Isolation, Characterization, and Genome Annotation. 2023 ASM Intermountain Branch Meeting, Provo, UT.
16. Olsen, NA, Harris, JA, Call, AB, McCain, SA, Wilhite TJ, Harrell JR, Harrell CC, Pang DT, Grose JH, Breakwell DP, Pickett. BE. The Third Wheel Tail: The Tail Assembly Chaperone Protein of Microbacterium Bacteriophages in the EG cluster. 2023 ASM Intermountain Branch Meeting, Provo, UT.
17. Owens AR, Aranda H, Baeten IW, Ball JK, Collingridge BJ, Crowther EM, Davis SC, Ebbert MR, Gardner AM, Hafen PB, Hardcastle AR, Harrell CC, Hasegawa GP, Kemeny RJ, Naylor CB, Pang DTI, Parsons LM, Poulson JW, Pulley BJ, Rawlins M, Robinson NM, Shreeve DR, Sombke BK, Sutherland MH, Taylor BD, Brown GR, Harrell JR, Hess DS, Johnson AM, Wilhite TJ, Grose JH, Pickett BE, Breakwell, DP. The Genome of Microbacterium foliorum phage Sarbear, a novel member of the EB cluster, 2022 ASM Intermountain Branch Meeting, Provo, UT.
18. Hardcastle AR, Aranda H, Baeten IW, Ball JK, Collingridge BJ, Crowther EM, Davis SC, Ebbert MR, Gardner AM, Hafen PB, Harrell CC, Hasegawa GP, Kemeny RJ, Naylor CB, Owens AR, Pang DTI, Parsons LM, Poulson JW, Pulley BJ, Rawlins M, Robinson NM, Shreeve DR, Sombke BK, Sutherland MH, Taylor BD, Brown GR, Harrell JR, Hess DS, Johnson AM, Wilhite TJ, Grose JH, Pickett BE, Breakwell, DP. Isolation and Genome Analysis of Microbacterium foliorum bacteriophage FireCastle. 2022 ASM Intermountain Branch Meeting, Provo, UT.
19. Downey J. Griffin B, Jensen A, Ludwig A, Scott TM, Spencer J, Thomas B, Vander Werff K, Grose JH, Breakwell DP. Comparative Genomic Analysis of M. foliorum Cluster EE Phages. 2021 SEA Symposium, HHMI Virtual Meeting.
20. Thomas B, Scott TM, Moon M, Moran M, Wells B, Brown, M, Cox S, Packard T, Griffin B, Spencer J, Jensen A, Vander Werff KJ, Downey J, Lee Y, Chamberlain J, Doxey E, Eastley D, Hendricks M, Grose JH, Breakwell, DP. Characterization of novel *Microbacterium foliorum* bacteriophage Bri160. 2021 SEA Symposium,

HHMI Virtual Meeting.

21. Packard T, Brown M, Cox S, Doxey E, Anderson C, Thomas B, Grose JH, Breakwell, DP. Tail Assembly Chaperone Proteins of *Microbacterium foliorum* Cluster EE Phages. 2021 SEA Symposium, HHMI Virtual Meeting.
22. Jensen M, Eddington M, Robertson R, Brown G, Cherry A, Christensen S, Franz N, Fratangelo I, Hales B, Harrell J, Hutchison N, Johnson A, May J, Wilhite T, Downey J, Jensen A, Cox S, Brown M, Scott TM, Grose JH, Breakwell DP. The Genome of *Microbacterium foliorum* phage Mandalorian. 2021 SEA Symposium, HHMI Virtual Meeting.
23. Wilhite T, Harrell J, Jensen M, Brown G, Cherry A, Christensen S, Eddington M, Franz N, Fratangelo I, Hales B, Hutchison N, Johnson A, May J, Robertson R, Downey J, Jensen A, Cox S, Brown M, Scott TM, Grose JH, Breakwell DP. Saratos: A Newly Isolated and Novel *Microbacterium foliorum* Bacteriophage. 2021 SEA Symposium, HHMI Virtual Meeting.
24. Brown G, Christensen S, Fratangelo I, Hutchison N, Brown M, Cox S, Downey J, Jensen A, Scott TM, Grose JH, Breakwell DP. A Comparative Analysis of *Microbacterium foliorum* Phage Subclusters EA5 Through EA11. 2021 SEA Symposium, HHMI Virtual Meeting.
25. Cherry A, Franz N, Johnson A, May J, Downey J, Jensen A, Cox S, Brown M, Scott TM, Grose JH, Breakwell, DP. The Remarkably Homogenous EA2 Subcluster of *Microbacterium foliorum* Phages. 2021 SEA Symposium, HHMI Virtual Meeting.
26. Crump M, Breakwell DP. (2019) Phosphate-solubilizing bacteria isolated from the roots of a tomato plant (Solanum lycopersicum.) Intermountain ASM Branch Meeting, Provo, UT.
27. Taylor A, Davis R, Gaertner R, Thurgood T, Breakwell DP, Grose, JH. (2019) RNA sequencing of Enterobacteriaceae Bacteriophages to Determine Gene Functions. Intermountain ASM Branch Meeting, Provo, UT.
28. Gleave AN, Carr EL, Melhado E, Breakwell DP, Hope S, Grose, JH. (2019) Characterization of 18 Bacteriophage Families Based on Distinct Protein Profile. Intermountain ASM Branch Meeting, Provo, UT.
29. Rodriguez A, Allen K, Loertscher E, Melhado E, Breakwell DP, Hope S, Grose, JH. (2019) Characterization of diversity in T-4 like Bacteriophages. Intermountain ASM Branch Meeting, Provo, UT.
30. Rodriguez A, Carr EL, Gaertner R, Kruger J, Melhado E, Loertscher E Breakwell DP, Hope S, Grose, JH. (2019) Isolation and Characterization of Novel but Ubiquitous Family of Serratia Phages. Intermountain ASM Branch Meeting, Provo, UT.
31. Moe MB, Michael C, Hanis TF, Stoker TA, Elton D, Flor SA, Divis T, Uricoechea L, Thurgood T, Breakwell DP, Robison RA, Grose JH. (2019) Discovering Antibiotic Resistance Genes In Bacteriophages. Intermountain ASM Branch Meeting, Provo, UT.
32. Cluff E, Abrams S, Allen C, Calder B, Carter O, Clarke T, Davies B, Doxey E, Eastley D, Hendricks MC, Merrill B, Miller P, O'Brien C, Ochsner R, Olsen H, Phillips H, Riddle A, Routsong J, Torgersen K, Wadsworth S, Weatherred M, Weeks S, Chamberlain JD, Ellis KJ, Hope S, Grose JH, Breakwell DP (2019) Host Range Analysis of Sinorhizobium Phages Reveals New Avenues for Studying Phage Receptor Binding. Intermountain ASM Branch Meeting, Provo, UT.
33. Olsen H, Weatherred M, Abrams S, Allen C, Calder B, Carter O, Clarke T, Cluff E, Davies B, Doxey E, Eastley D, Hendricks MC, Merrill B, Miller P, O'Brien C, Ochsner R, Phillips H, Riddle A, Routsong J, Torgersen K, Wadsworth S, Weeks S, Arens D, Chamberlain JD, Ellis KJ, Hope S, Grose JH, Breakwell DP (2019) Host Range Analysis of Sinorhizobium Phages Reveals New Avenues for Studying Phage Receptor Binding. Intermountain ASM Branch Meeting, Provo, UT.
34. Fajardo C, Meredith S, Roll C, Griffiths JS, Hope S, Grose JH, Breakwell DP. (2018) Proof of Concept: Determining Phage Adsorption Using Flow Cytometry. Intermountain ASM TriBranch Meeting, Durango, CO.
35. Whitlock T, Greene N, Creaser I, Knowles A, Karlinsey D, Nelson N, Barton K, Bateman J, Quist N, Hendrickson J, Ellis K, Chamberlain J, Jenkins J, Fajardo C, Fuhriman DA, Griffitts, JS, Hope S, Grose JH, and Breakwell, DP. (2018) The genomes of CW76, a unique phage, and XTREME, a T4-like phage infecting *Sinorhizobium meliloti*. Intermountain ASM TriBranch Meeting, Durango, CO.
36. Jenkins J, Whitlock T, Greene N, Creaser I, Knowles A, Karlinsey D, Nelson N, Barton K, Bateman J, Quist N, Hendrickson J, Ellis K, Chamberlain J, Fajardo C, Fuhriman DA, Griffitts, JS, Hope S, Grose JH, and Breakwell, DP. (2018) Host Range and Receptor Binding of 13 Newly-Isolated Phages Infecting *Sinorhizobium meliloti.* Intermountain ASM TriBranch Meeting, Durango, CO.
37. Melhado E, Chow J, Wiley M, Sarabia R, Standing N, Hope S, Breakwell D, and Grose JH. (2018) Isolation and Characterization of Sewage Phages. Intermountain ASM TriBranch Meeting, Durango, CO.
38. Hyer MG, Call J, Dawson DD, Chronis JD, Ayala MA, FinneganZ, Fox A, Hielscher T, Yeates EL, Breakwell DP, and Grose JH. Identification of promiscuous sewage phage. Intermountain ASM TriBranch Meeting, Durango, CO.
39. Melhado E, Sarabia R, Loertscher, E, Sharma R, Breakwell DP, and Grose JH. (2018) Bacteriophage

Diversity Revealed by Nine Novel Enterobacteriaceae Phages Isolated from Sewage Samples. Intermountain ASM TriBranch Meeting, Durango, CO.

40. Tueller, JA, Jensen, JL, Breakwell, DP, Johnson SM, Weber, KS. (2018) Personal microbiome analysis enhances student engagement in life sciences courses. Intermountain ASM TriBranch Meeting, Durango, CO.
41. Allen RC, Bybee RN, Fuhriman DA, Ririe DB, Thompson SE, Usher BK, Breakwell DP, Grose JH, Hope S. Genome Analysis of Lycanus and DevRi. (2016) Phage Phield Day, Brigham Young University, Provo, UT.
42. Harris N, Hurst E, Brady J, Pollock S, Smith H, Webb C, Fajardo C, Hilton J, Ward A, Breakwell DP, Grose JH, Hope S. Genomic Characterization of Honeybear and Related Phage Toothless (2016) Phage Phield Day, Brigham Young University, Provo, UT.
43. Bloomfield T, Buhler B, Duncan S, Knabe B, Stephenson M, Wells M, Wright C. Breakwell DP, Grose JH, Hope S. (2016) Genomic Analysis and Characterization of PBL1C: The First Discovered Paenibacillus Larvae Phage. Phage Phield Day, Brigham Young University, Provo, UT.
44. Harris N, Hurst E, Brady J, Pollock S, Smith H, Webb C, Fajardo C, Hilton J, Ward A, Breakwell DP, Grose JH, Hope S. Genomic Characterization of Honeybear and Related Phage Toothless (2016) Intermountain ASM Branch Meeting, Salt Lake City, UT.
45. Duncan S, Hurst E, Berg J, Ward A, Hilton J, Breakwell DP, Grose JH, and Hope SH. Paenibacillus Larvae Phages Contain Regions of Conserved Synteny Despite Large Genomic Differences (2016) HHMI SEA-PHAGES Symposium, Janelia Farms,Virginia.
46. Grose, JH, Simister, A, Heaton, K, Merrill, B, Berg, J, Thurgood T, Breakwell, DP, and Hope, S. (2015), The Mosaic Nature and Evolution of Three Brevibacillus Phages and Their Impact on Brevibacillus laterosporus and Other Bacteria. Intermountain ASM Branch Meeting, Durango, CO.
47. Grose, JH, Crockett, JT, Esplin, KP, Hyde, JR, Breakwell, DP, and Hope, S. (2015), Brevibacillus Bacteriophages Xane and Jenst Reveal a DNA Motif Indicating a Gene Regulatory Sequence, Intermountain ASM Branch Meeting, Durango, CO.
48. Grose, JH, Hilton, JA, Schouten, JT, Merrill, B, Berg, J, Breakwell, DP, and Hope, S. (2015), Discovery of Two Novel Phage Clusters in Brevibacillus laterosporus Using Comparative Genomics, Intermountain ASM Branch Meeting, Durango, CO.
49. Grose, JH, McBride, MS, Brundage, BM, Berg, J, Merrill, B, Evans, MR, Breakwell, DP, and Hope, S. (2015), Comparing Protein Structures of a Transcriptional Regulator Repeated in Brevibacillus Phages. Intermountain ASM Branch Meeting, Durango, CO.
50. Taylor, AS, Bairett, SR, Wienclaw, TM, Ashcroft, CR, Esplin, ID, Schoenhals, JE, Merrill, BD, Breakwell, DP, Grose, JH, and Burnett SH. (2014) Poster Presentation. Isolation and Characterization of Paenibacillus larvae Bacteriophage Jenst. Poster presentation. ASM Intermountain Branch Meeting, BYU, Provo, UT.
51. Ransom, E, Berg, J, Grossarth, S, Smith, H, Anieves, D, Esplin, ID, Merrill, BD, Schoenhals, JE, Breakwell, DP, Burnett, SH, and Grose JH. (2014) Comparative Genome Analysis of Seven Novel Erwinia Phages Reveals Orthologous Proteins and Allows for Formation of a Cluster with Three Known Enterobacteriaceae Phages. Poster presentation. ASM Intermountain Branch Meeting, BYU, Provo, UT.
52. Stratton, M, Harbaugh, K, Foy, B, Anieves, D, Paz, H, Shurtleff, C, Kruger J, Peck, M, Jensen, G, Esplin, ID, Merrill, BD, Schoenhals, JE, Breakwell, DP, Burnett, SH, and Grose JH. (2014) Discovery and Genomic Analysis of an N4-like Erwinia amylovora Phage. Poster presentation. ASM Intermountain Branch Meeting, BYU, Provo, UT. Ingersoll, K, Jensen, G, Kruger, J, Foy, B, Grossarth, S, Harbaugh, K, Paz, H, Esplin, ID, Schoenhals, JE, Merrill, BD, Burnett, SH, Breakwell, DP, and Grose JH. (2014)
53. Isolation and Characterization of Deimos-Minion, the Largest Erwinia amylovora Bacteriophage. Poster presentation. ASM Intermountain Branch Meeting, BYU, Provo, UT.
54. Schoenhals, JE, Merrill, BD, Graves, KA, Grose, JH, Burnett, SH, and Breakwell DP. (2014) DNA Packaging Strategies for Bacteriophages Identified Using Phylogenetic Analysis of Large Terminase Proteins. Poster presentation. ASM Intermountain Branch Meeting, BYU, Provo, UT.
55. Jensen, JL, Berg, JA, Esplin, ID, Foy, BM, Grossarth, SE, Harbaugh, K, Ingersoll, K, Kruger, JL, Peck, MD, Ransom, EK, Smith, HG, Stratton, JL, **Breakwell, DP**, Burnett, SH, and Grose JH. (2013) Isolation and Characterization of Eleven Phages that Infect Erwinia amylovora. Oral presentation. HHMI SEA-PHAGES Symposium, Janelia Farms,Virginia. Honorable mention
56. Jensen, JD, (2013), J.N.B. Fisher, J.H. Grose, S.H. Burnett, and **D.P. Breakwell**. Isolation and Characterization of Three Novel Bacteriophages of *Bacillus cereus*. American Society for Microbiology General Meeting, Denver, CO.
57. Merrill BD, Sheflo MA, Ayer PA, Beckstead AP, Fajardo CP, Ferguson NC, Fisher JNB, Gardner AV, Graves KA, Hartmann KA, Kennedy AK, Liu JE, Lunt BL, Merrill CA, Russell RC, Wake BN, WilliamsKR, Zimmerman LJ, Grose JH, **Breakwell DP**, Burnett SH. (2013) Discovery and Characterization of Novel Paenibacillus larvae Bacteriophages. 5th Annual SEA-Phages Symposium, Ashburn, VA.

58. Herring JA, Deus LM, Manci AM, Meadows HN, Heiner ME, Willyerd HJ, Gardner AV, Fisher JNB, Smith K, Grose JH, **Breakwell DP**, Burnett SH (2013) Phage cluster and subcluster identification using Tape Measure Protein primers in a PCR reaction. 5th Annual SEA-Phages Symposium, Ashburn, VA.
59. Merrill BD, Sheflo MA, Ayer PA, Beckstead AP, Fajardo CP, Ferguson NC, Fisher JNB, Gardner AV, Graves KA, Hartmann KA, Kennedy AK, Liu JE, Lunt BL, Merrill CA, Russell RC, Wake BN, WilliamsKR, Zimmerman LJ, Grose JH, **Breakwell DP**, Burnett SH. (2013) Discovery and Characterization of Novel Paenibacillus larvae Bacteriophages. ASM Intermountain Branch Meeting, Idaho State University, Pocatello, ID.
60. Ferguson, NC, Irons, DL, Marlow, SC, McCord, TM, Brighton, AK, Fisher, JNB, Sheflo, MA, **Breakwell, DP**, Grose, JH, Burnett, SH (2012) Division of the Mycobacteriophage A1 Subcluster Based on Phylogenetic Comparison. ASM Intermountain Branch Meeting, Idaho State University.
61. Mason, SJ, Gardner, AV, Nelson, EP, Christiansen, MR, Brighton, AK. Fisher, JNB, Sheflo, MA, **Breakwell, DP**, Grose, JH, Burnett, SH (2012) Mislabeling of the Second Tape Measure Protein. ASM Intermountain Branch Meeting, Idaho State University.
62. Jensen, JD, Merrill, BD, Russell, RC, Smith, TC, Brighton, AK, Fisher, JNB, Sheflo, MA, **Breakwell, DP**, Burnett, SH, Grose, JH. (2012) Phylogenetic Origin of Glutaredoxin Gene Shared by Mycobacteriophage A1 Sub-cluster, Distantly Related Bacteria, and other bacteriophages. ASM Intermountain Branch Meeting, Idaho State University.
63. Joshua S. Lloyd, Christian S. Norton, Shea Sullivan, Shanette M. Pettersson, Brighton, AK, Fisher, JNB, Sheflo, MA, **Breakwell, DP**, Erickson, D, Burnett, SH, Grose, JH. (2012) Lack of Correlation between Phage Clusters and Ecoregions in the United States. ASM Intermountain Branch Meeting, Idaho State University.
64. Williams, KR, Adawi, EC, Kennedy, AK, Poe, DE, Brighton, AK, Fisher, JNB, Sheflo, MA, **Breakwell, DP**, Burnett, SH, Grose, JH. (2012) Divergent evolution of a RuvC holliday junction resolvase in the B1 subcluster. ASM Intermountain Branch Meeting, Idaho State University.
65. Gardner, AV, Brighton, AK, Fisher, JNB, Sheflo, MA, **Breakwell, DP**, Grose, JH, Burnett, SH. (2012) Environmental Effect on Phage Genomes: Analysis of the B4 Subcluster. ASM Intermountain Branch Meeting, Idaho State University.
66. JH Grose, **DP Breakwell**, SH Burnett. 2011. Out of the SEA: Getting Students to Crawl on Land. Howard Hughes Medical Institute NGRI Third Annual Symposium, Ashburn, VA.
67. Brighton, AK, Fisher, JNB, Lunt, BL, Taylor, MA, Smith, KC, Baker, B, Barrus, EZ, Chapman, KM, Drake, EA, Jackson, KR, Kartchner, BJ, Kiser, CD, Kiser, JT, Kitchen, JCB, McDaniel, SW, Ormsby, WR, Parker, M, Sheide, MG, Steck, RP, Vance, KS**, Breakwell, DP**, Burnett, SH, and Grose, JH. (2011) Additional Evidence for Frameshifts in A2 and Gene Mosaicism in F Mycobacteriophage. Howard Hughes Medical Institute Third Annual Phage Symposium, Ashburn, VA.
68. Kartchner BK , JT Kiser, CD Kiser et al. 2011. Clustering of Mycobacteriophage in the Utah Landscape. American Society for Microbiology Intermountain Branch Meeting, Ogden, UT.
69. KC Smith, SH Burnett, JH Grose, **DP Breakwell**. 2011. Degenerate PCR Primers to Identify Mycobacteriophage Clusters and Sub-Clusters. American Society for Microbiology Intermountain Branch Meeting, Ogden, UT.
70. AK Brighton, KS Vance, KR Jackson et al. 2011. Gene Mosaicism Demonstrated in Mycobacteriophage Shauna1. American Society for Microbiology Intermountain Branch Meeting, Ogden, UT.
71. JCB Kitchen, AK Brighton, KM Chapman, et al. 2011. Morphological Traits of Mycobacteriophage Clusters and Sub-Clusters. American Society for Microbiology Intermountain Branch Meeting, Ogden, UT.
72. EZ Barrus, MG Sheide, MA Taylor, et al. 2011. Shauna1 Mycobacteriophage holin gene confirms common ancestry of all F cluster phage. American Society for Microbiology Intermountain Branch Meeting, Ogden, UT.
73. KM Chapman, B Baker, EA Drake, et al. 2011. TA17A: A Unique Member of the Mycobacteriophage Sub-Cluster A2. American Society for Microbiology Intermountain Branch Meeting, Ogden, UT.
74. **DP Breakwell** and SH Burnett. (2010) Data Overload: Letting Freshmen Students "Have At" Mycobacteriophage Lab Work and Comparative Genomics. Howard Hughes Medical Institute NGRI Second Annual Symposium, Ashburn, VA.
75. CJ Sargent, DE Payne, II, BL Lunt, LB Argueta, PB, AB Benedict, LA Bull, ME Daetwyler, BJ Earley, JM Engle, JNB Fisher, I Giri, E Greenhalgh, AW Hansen, KJ Haskell, TF Issac, KL, ZS Liechty, SK Petersen, DS Sabin, MC Severson, KC Smith, MAR Taylor, TJ Woodward, BA Wright, SH Burnett, **DP Breakwell**. (2010) Genomic Analysis of the Newly- Isolated Subcluster B1 Mycobacteriophage KLucky39 Reveals a Novel Putative Peptidase and a Primase, the Lack of Five Anticipated Genes, and the Relationship of KLucky39 to Other Phage. Howard Hughes Medical Institute NGRI Second Annual Symposium, Ashburn, VA.
76. Grose, J. and **D.P. Breakwell**. 2010. Using Bakers Yeast to Teach Life Cycles of Eukaryotic Microbes. American Society for Microbiology Conference for Undergraduate Educators, San Diego, CA.
77. KC Smith, ME Daetwyler, ZS Liechty, MC Severson, B Wright, BL Lunt, DE Payne II, **DP Breakwell**, and SH

Burnett (2010) Tape Measure Protein in Mycobacteriophage KLucky39 Shows Evolution of Phage Clusters. American Society for Microbiology Intermountain Branch Meeting, Provo, UT.

78. L Argueta, S Petersen, D Sabin, C Sargent, MA Taylor, BL Lunt, DE Payne II, **DP Breakwell**, and SH Burnett (2010) Addition of Novel Mycobacteriophage to Pre-existing Subclusters of the B Cluster. American Society for Microbiology Intermountain Branch Meeting, Provo, UT.
79. A Hansen, K Ladle, A Benedict, BL Lunt, DE Payne II, SH Burnett, and **DP Breakwell** (2010) Mycobacteriophage Exhibit Discrepancies in the Distance of Shine-Dalgarno Sequences from the Start Codon. American Society for Microbiology Intermountain Branch Meeting, Provo, UT.
80. J Fisher, I Giri, T Issac, S Burnett, **D Breakwell** (2010) The Mycobacteriophage KLucky39 Genome Lacks Five Genes Commonly Found in Other Mycobacteriophage Subcluster B1 Genomes. American Society for Microbiology Intermountain Branch Meeting, Provo, UT.
81. J Engle, T Woodward, E Greenhalgh, K Haskell, BL Lunt, DE Payne II, **DP Breakwell** and SH Burnett (2010) The Genome of Mycobacteriophage KLucky39 Reveals a Putative M23 Peptidase Gene. American Society for Microbiology Intermountain Branch Meeting, Provo, UT.
82. K Haskell, B Earley, P Bajgain, **D Breakwell**, and S Burnett (2010) Comparison of KLucky39 Mycobacteriophage With Bacterium E. Coli. Microbiology and Molecular Biology Brigham Young University. American Society for Microbiology Intermountain Branch Meeting, Provo, UT.

Publication of Full Genomes in Genbank (NCBI)

~80 complete phage genomes with complete annotation of all genes and identification of any tRNA genes. Genomes were peer reviewed by GenBank prior to acceptance and publication.

Proposals Submitted, and Funded (since 2009)

1. Phage Hunters: Discovery and Bioinformatics 2014. Principal Investigators: Julianne H. Grose, Sandra H. Burnett and Donald P. Breakwell. Private donor Amount: $200,000
2. Howard Hughes Medical Institute. 2009-2011. Science Education Alliance-Phage Genome Research Initiative. (No cash value available)

Consulting

2013-2018 Esplin Biotechnologies, LLC. Scientific Advisory Board.