

Donald Philip Breakwell, Ph.D.

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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-present	Assistant Dean, Director of Student Services, College of Life Sciences, Brigham Young University
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

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. 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., Mancini, 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
2. 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
3. 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.
4. 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, Fuhrman 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.

5. 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
6. 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.
7. 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.
8. 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.
9. 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, Fuhrman 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.
10. 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>.
11. 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
12. 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
13. 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.
14. 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
15. 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.
16. 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
17. 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.
18. 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.
19. 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.

20. **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.
21. Sheffo 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.
22. **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.
23. P.S. Shen, M. J. Domek, E. Sanz-García, A. Makaju, R. M. Taylor, R. Hoggan, M. D. Cumber, 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
24. 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
25. **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. Crump M, Breakwell DP. (2019) Phosphate-solubilizing bacteria isolated from the roots of a tomato plant (*Solanum lycopersicum*.) Intermountain ASM Branch Meeting, Provo, UT.
2. 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.
3. 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.
4. 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.
5. 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.
6. 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.
7. 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, Weathered 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.
8. Olsen H, Weathered 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.
9. 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.
10. 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, Fuhrman DA, Griffiths, 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.
11. 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, Fuhrman DA, Griffiths, 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.
12. 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.

13. Hyer MG, Call J, Dawson DD, Chronis JD, Ayala MA, Finnegan Z, Fox A, Hielscher T, Yeates EL, Breakwell DP, and Grose JH. Identification of promiscuous sewage phage. Intermountain ASM TriBranch Meeting, Durango, CO.
14. 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.
15. 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.
16. Allen RC, Bybee RN, Fuhrman 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.
17. 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.
18. 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.
19. 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.
20. 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.
21. 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.
22. 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.
23. 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.
24. 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.
25. 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.
26. 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.
27. 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)
28. Isolation and Characterization of Deimos-Minion, the Largest *Erwinia amylovora* Bacteriophage. Poster presentation. ASM Intermountain Branch Meeting, BYU, Provo, UT.
29. 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.
30. 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
31. 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.

32. 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.
33. Herring JA, Deus LM, Mancini 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.
34. 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.
35. 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.
36. 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.
37. 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.
38. 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.
39. 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.
40. 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.
41. 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.
42. 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.
43. 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.
44. 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.
45. AK Brighton, KS Vance, KR Jackson et al. 2011. Gene Mosaicism Demonstrated in Mycobacteriophage Shauna1. American Society for Microbiology Intermountain Branch Meeting, Ogden, UT.
46. 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.
47. 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.
48. 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.
49. **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.
50. 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.
51. 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.
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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

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