THE UNIVERSITY OF MAINE

Professor Andre Khalil
Chemical and Biomedical Engineering

Publications

Refereed Publications

1. Hamilton, J, Breggia, A, Fitzgerald, TL, Jones, MA, Brooks, PC, Tilbury, KB, **Khalil, A** 2022 *Multiscale anisotropy analysis of second-harmonic generation collagen imaging of human pancreatic cancer*. Frontiers in Oncology, 12:991850. doi: 10.3389/fonc.2022.991850

2. Liu, J, Enderlin, E, Marshall, HP, **Khalil, A** 2022 *Synchronous retreat of southeast Greenland's peripheral glaciers*. Geophysical Research Letters 49 (13), e2022GL097756. doi: 10.1029/2022GL097756.

3. Juybari, J, **Khalil, A** 2022 *Elimination of image saturation effects on multifractal statistics using the 2D WTMM method*. Frontiers in Physiology. 13:921869. doi: 10.3389/fphys.2022.921869.

4. Willows, JW, Blaszkiewicz, M, Lamore, A, Borer, S, Dubois, AL, Garner, E, Breeding, WP, Tilbury, KB, **Khalil, A**, Townsend, K 2021 *Visualization and analysis of whole depot adipose tissue neural innervation.* iScience. 24(10), 103127. doi: 10.1016/j.isci.2021.103127

5. Castro, IJ, Toner, BC, Xie, SQ, Swingland, J, Hodges, A, Tabrizi, SJ, Turkheimer, F, Pombo, A, **Khalil, A** 2021 *Altered nuclear architecture in blood cells from Huntington's disease patients*. Neurological Sciences. 43 (1) 379-385. doi: 10.1007/s10072-021-05289-w

6. Tilbury, K, Han, X, Brooks, P, **Khalil, A** 2021. *Multiscale Anisotropy Analysis of Second-Harmonic Generation Collagen Imaging of Mouse Skin*. Journal of Biomedical Optics. 26(6), 065002. doi: 10.1117/1.JBO.26.6.065022

7. Gerasimova-Chechkina, E, Toner, BC, Batchelder, KA, White, B, Freynd, G, Antipev, I, Arneodo, A, **Khalil, A** 2021. *Loss of mammographic tissue homeostasis in invasive lobular and ductal breast carcinomas vs. benign lesions*. Frontiers in Physiology – Fractal Physiology. 12, 660883. doi: 10.3389/fphys.2021.660883

8. Liu, J, Enderlin, EM, Marshall, HP, **Khalil, A** 2021. *Automated detection of marine glacier calving fronts using the 2D Wavelet Transform Modulus Maxima (WTMM) segmentation method*. IEEE Transactions on Geoscience and Remote Sensing. 59(11), 9047-9057. DOI:10.1109/TGRS.2021.3053235

9. Robitaille, JF, Abdeldayem, A, Joncour, I, Moraux, E, Motte, F, Lesaffre, P, **Khalil, A** 2020. *Statistical model for filamentary structures of molecular clouds. The modified multiplicative random cascade model and its multifractal nature.* Astronomy & Astrophysics. 641, A138 (11 pages).

10. Marquis, K, Chasse, B, Regan, DP, Boutiette, A, **Khalil, A**, Howell, C 2019, *Vascularized Polymers Spatially Control Bacterial Cells on Surfaces*. Advanced Biosystems, 4 (10), 1900216.

11. Bailey, EC, Alrowaished, SS, Kilroy, EA, Crooks, ES, Drinkert, DM, Karunasiri, CM, Belanger, JJ, **Khalil, A**, Kelley, JB, & Henry, CA 2019, *NAD+ improves neuromuscular development in a zebrafish model of FKRP-associated dystroglycanopathy*. Skeletal Muscle, 9 (1), 1-23.

12. Bradley, DM, D'Alessio, D, **Khalil, A**, Niemeyer, RG, Ossanna, E, Tanenbaum, A, Toner, B 2019, *On the relative frequency of residue classes in Pascal's Triangle modulo a prime*. Fractals, 27 (06) 1950098.

13. Garrett, AM, **Khalil, A**, Walton, D, Burgess, RW 2018, *DSCAM promotes self-avoidance in the developing mouse retina by masking the functions of cadherin superfamily members***. PNAS,** 115 (43), E10216-E10224.

14. Bradley, DM, **Khalil, A**, Niemeyer, RG, Ossanna, E 2018 *The Box-Counting Dimension of Pascal's Triangle r mod p*. Fractals, 26, 05, 1850071.

15. Marin, Z, Wallace, JK, Nadeau, JL **Khalil, A** 2017 *Wavelet-based tracking of bacteria in unreconstructed, off-axis holograms*. Methods, doi.org/10.1016/j.ymeth.2017.09.003.

16. Marin, Z, Batchelder, KA, Toner, BC, Guimond, L, Gerasimova-Chechkina, E, Harrow, AR, Arneodo, A and **Khalil, A** 2017 *Mammographic evidence of microenvironment changes in tumorous breasts*. Medical Physics, 44:1324-1336. doi:10.1002/mp.12120

17. Gerasimova-Chechkina, E, Toner, B, Marin, Z, Audit, B, Roux, SG, Argoul, F, **Khalil, A**, Gileva, O, Naimark, O, Arneodo, A 2016 *Comparative multifractal analysis of dynamic infrared thermograms and X-ray mammograms enlightens changes in the environment of malignant tumors*, Frontiers in Physiology, 7, 336 (15 pages)

18. Plourde, SM, Marin, Z, Smith, ZR, Toner, BC, Batchelder, KA, **Khalil, A** 2016. Computational growth model of breast microcalcification clusters in simulated mammographic environments. Computers in Biology and Medicine, 76, 7-13

19. Richard, CD, Tanenbaum, AB, Audit, B, Arneodo, A, **Khalil, A**, Frankel, WN 2015. *SWDreader: A Wavelet-Based Algorithm Using Spectral Phase to Detect and Characterize Spike-Wave Discharges in Three Genetic Mouse Models of Absence Epilepsy*, Journal of Neuroscience Methods, 242, 127-140

20. Batchelder, KA, Tanenbaum, AB, Albert, S, Guimond, L, Kestener, P, Arneodo, A, **Khalil, A** 2014. *Wavelet-based 3D reconstruction of microcalcification clusters from two mammographic views: New Evidence that fractal tumors are malignant and Euclidean tumors are benign*, PLoS One, 9 (9) e107580 (11 pages).

21. Gerasimova, E, Audit, B, Roux, SG, **Khalil, A**, Argoul, F, Naimark, O, Gileva, O, Arneodo, A 2014. *Interdisciplinary approach for estimating and differentiating healthy and cancerous breast tissues with a multifractal analysis of skin temperature dynamics,* Russian Journal of Biomechanics, 18(1), 79-91.

22. Gerasimova, E, Audit, B, Roux, SG, **Khalil, A**, Gileva, O, Argoul, F, Naimark, O, Arneodo, A 2014 *Wavelet-based multifractal analysis of dynamic infrared thermograms to assist in early breast cancer diagnosis*, Frontiers in Physiology, 5, 176 (11 pages).

23. Gerasimova, E, Audit, B, Roux, SG, **Khalil, A**, Argoul, F, Naimark, O, Arneodo, A, 2013. *Multifractal Analysis of Dynamic Infrared Imaging of Breast Cancer*, Europhysics Letters, 104 (6), 68001 (6 pages)

24. Wu, Y, Batuski, D, **Khalil, A**, 2013. *Nearest Neighbor Vector Analysis of SDSS DR5 Galaxy Distribution*, Natural Science, 5 (1), 26619 (5 pages)

25. Goody, MF, Kelly, MW, Reynolds, CJ, **Khalil, A**, Crawford, BD, Henry, CA 2012. *NAD+ Biosynthesis Ameliorates*

a Zebrafish Model of Muscular Dystrophy, PLoS Biology, 10 (10), e1001409 (17 pages)

26. Wu, Y, Batuski, D, **Khalil, A**, 2012. *Three-Dimensional Filamentation Analysis of SDSS DR5 Survey*, IRSN Astronomy & Astrophysics, 171829 (7 pages).

27. McAteer, RT, Kestener, P, Arneodo, A, **Khalil, A** 2010. *Automated Coronal Loop Detection using a Wavelet Transform Modulus Maxima Method*, Solar Physics, Solar Image Processing and Analysis, 262, 387-397.

28. Robitaille, JF, Joncas, G, **Khalil, A** 2010. *Morphological Analysis of HI Features. III. Metric Space Technique Revisited*, Monthly Notices of the Royal Astronomical Society, 405, 636-656.

29. Kestener, P, Conlon, PA, **Khalil, A**, Fennell, L, McAteer, RTJ, Gallagher, PT, Arneodo, A 2010. *Characterising Complexity in Compound Systems: Segmentation in Wavelet-Space*, Astrophysical Journal, 717, 995-1005.

30. Goody, MF, Kelly, MW, Lessard, KN, **Khalil, A**, Henry, CA 2010. *Nrk2b-mediated NAD+ production regulates cell adhesion and is required for muscle morphogenesis in vivo: Nrk2b and NAD+ in muscle morphogenesis*, Developmental Biology, 344, 809-826.

31. Grant, J, Verrill, C, Coustham, V, Arneodo, A, Paladino, F, Monier, K, **Khalil, A** 2010. *Perinuclear distribution of heterochromatin in developing C. elegans embryos*, Chromosome Research, 18, 873-885.

32. **Khalil A**, Aponte, C, Zhang R, Davisson, TH, Dickey, I, Engelman D, Hawkins M, Mason, M 2009. *Image analysis of soft-tissue in-growth and attachment into highly porous alumina ceramic foam metals*, Medical Engineering and Physics, 31, 775-783.

33. Wu, Y, Batuski, D, **Khalil, A** 2009. *Multi-Scale Morphological Analysis of SDSS DR5 Survey Using the Metric Space Technique*, Astrophysical Journal, 707, 1160-1167.

34. Roland, T, **Khalil, A**, Tanenbaum, A, Berguiga, L, Delicheree, P, Bonneviot, L, Elezgaray, J, Arneodo, A, Argoul, F 2009. *Revisiting the physical processes of vapodeposited thin gold films on chemically modified glass by atomic force and surface plasmon microscopies*, Surface Science, 603, 3307-3320.

35. Snow, CJ, Goody, M, Kelly, MW, Oster, EC, Jones, R, **Khalil, A**, and Henry, CA 2008, *Time-lapse analysis and mathematical characterization elucidate novel mechanisms underlying muscle morphogenesis*. PLoS Genetics, 4(10):e1000219 (18 pages).

36. Snow CJ, Peterson, M, **Khalil, A**, Henry C 2008. *Muscle development is disrupted in zebrafish embryos deficient for Fibronectin*, Developmental Dynamics, 237, 2542-2553.

37. **Khalil, A**, Grant, JL, Caddle, LB, Atzema, E, Mills, KD, Arneodo, A 2007. *Chromosome territories have a highly non-spherical morphology and non-random positioning*. Chromosome Research, 15, 899-916.

38. Caddle, LB, Grant, JL, van Hase, J, Denegre, J, Shirley, BJ, Bewersdorf, J, Cremer, C, Arneodo, A, **Khalil, A**, & Mills, KD 2007 *Heterologous chromosome territory neighborhoods promote translocation susceptibility in primary lymphocytes*. Chromosome Research, 15, 1061-1073.

39. **Khalil, A**, Joncas, G, Nekka, F, Kestener, P, & Arneodo, A 2006, *Morphological Analysis of HI Features II: Wavelet-Based Multifractal Formalism*, Astrophysical Journal Supplement Series, 165, 512-550.

40. **Khalil, A**, Joncas, G, & Nekka, F 2004, *Morphological Analysis of HI Features I: Metric Space Technique*, Astrophysical Journal, Vol. 601, 352-364

Books

41. Wu, Y and **Khalil, A** 2009. *The Evolution of the Universe*. VDM Verlag, (76 pages).

42. Wu, Y, Batuski, D, and **Khalil, A** 2008. *The Fractal Structure of the Universe*. VDM Verlag, (80 pages).

Refereed Conference Proceedings

43. Harling, M, Blaszkiewicz, M, Willows, J, Johnson, J, Townsend, K, **Khalil, A**, Tilbury, K. 2020. 3D analysis of the spatial relationships of collagen and nerves in adipose tissue using the Metric Space Technique. In *Three-Dimensional and Multidimensional Microscopy: Image Acquisition and Processing XXVII. 112450R* (10 pages). https://doi.org/10.1117/12.2546918

44. Liu, J, Enderlin, EM, **Khalil, A**, 2019. *Unsupervised glacier terminus detection in satellite imagery using the 2D Wavelet Transform Modulus Maxima (WTMM) segmentation method*. GeoComputation 2019, Queenstown, New Zealand (8 pages). https://doi.org/10.17608/k6.auckland.9869606.v1

45. Breeding, PW, M Blaszkiewicz, K Townsend, **A Khalil**, and KB Tilbury 2019 *Exploratory investigation of the spatial relationships of collagen and nerves in subcutaneous white adipose tissue (scWAT) using 2-photon microscopy*. In *Multiphoton Microscopy in the Biomedical Sciences XIX* (Vol. 10882, p. 1088218). International Society for Optics and Photonics. (8 pages).

46. Gerasimova, E, Toner, B, Marin, Z, Audit, B, Roux, SG, Argoul, F, **Khalil, A**, Gileva, O, Naimark, O, Arneodo, A 2016 *Combining multifractal analyses of digital mammograms and infrared thermograms to assist in early breast cancer diagnosis*, in AIP Conference Proceedings, 1760, 020018 (11 pages).

47. Gerasimova, E, Audit, B, Roux, SG, **Khalil, A**, Gileva, O, Argoul, F, Naimark, O, Arneodo, A 2014 *A wavelet-based method for multifractal analysis of medical signals: Application to dynamic infrared thermograms of breast cancer*, in Nonlinear Dynamics of Electronic Systems: Communications in Computer and Information Science, 438, p. 288-300.

48. Dickey, ID, Donahue, DW, Peshlov, B, Nohe, A, **Khalil, A**, Mason, M, Zhang, R, Aponte, C, Davisson, TH, Engelman, D, Hawkins, M 2009. *Pore size modulates strength of soft-tissue in-growth and growth factor expression into novel porous titanium implants*, Transactions of the Orthopaedic Research Society, 34, 2213 (1 page).

49. **Khalil, A**, Mason, M, Dickey, ID, Zhang, R, Aponte, C, Davisson, TH, Engelman, D, Hawkins, M 2009. *Pore size and morphology modulate patterning of soft-tissue in-growth into porous titanium implants based on novel imaging tools*, Transactions of the Orthopaedic Research Society, 34, 478 (1 page).

50. **Khalil, A**, Mason, M, Dickey, I, Zhang, R, Aponte, C, Davisson, T, Engelman, D, Hawkins, M 2008, *Pattern of Soft Tissue In-Growth into Porous Implants Based on Novel Imaging Tools*, Transactions of the Orthopaedic Research Society, 33, 1877 (1 page).

51. Mills, KD, Caddle, LB, **Khalil, A**, Bewersdorf, J. 2006. *Imaging the Cancer Genome: High Resolution Microscopy and Quantitative Analyses*, Optical Society of America, paper WB5, (3 pages).

52. **Khalil A**, Joncas G, Nekka F 2002. *Exotic Tools for the Morphological Analysis of HI Clouds*, ASP Conference Proceedings, Vol. 276, Edited by A. R. Taylor, T.L. Landecker, and A.G. Willis, San Francisco, Astronomical Society of the Pacific, p. 194-197.

Conference Proceedings and Abstracts

53. Batchelder, KA, Cinelli, C, Harrow, AR, **Khalil, A** 2022. *Computational Assessment of Healthy vs. Risky Mammographic Breast Density*. Annual Meeting of the Radiological Society of North America, Chicago, IL.

54. Batchelder, KA, Cinelli, C, Harrow, AR, **Khalil, A** 2022. *Quantitative Visualization of Healthy vs. Risky Mammographic Breast Density*. Why Study Mammographic Density?, Melbourne, Australia.

55. Enderlin, EM, Liu, J, Bollen, K, Muhlheim, R, **Khalil, A** 2020. *Exploring Stability of Greenland's Peripheral Marine-Terminating Glaciers through Analysis of Automated Terminus Position Time Series*. American Geophysical Union Fall Meeting, Online.

56. Liu, J, Enderlin, EM, **Khalil, A**, Marshall, HP. 2020. *Southeast Greenland's marine-terminating peripheral glaciers underwent synchronous retreat in 2016 in respond to ocean-forcing*. American Geophysical Union Fall Meeting, Online.

57. Toner, B, **Khalil, A** 2020. *Exploratory computational longitudinal analysis of mammographic microenvironment disruption preceding breast tumorigenesis*. Cancer Research, 80 (4 supplement), P6-06-04.

58. **Khalil, A** 2020. *Wavelet based multifractal analysis of loss of tissue homeostasis in mammographic breast tissue*. AMS Special Session on Fractal Geometry, Dynamical Systems, and Applications, I. Joint Mathematics Meetings (American Mathematical Society and Mathematical Association of America), Denver, CO. Abstract #1154-92-1315.

59. Liu, J, Enderlin, EM, **Khalil, A** 2020. *Investigating spatiotemporal patterns in Greenland glacier terminus changes using automated edge detection in satellite images*. IASC-NAG Workshop on the Dynamics and Mass Budget of Arctic Glaciers & cross-cutting activity, Obergugl, Austria.

60. Liu, J, Enderlin, EM, **Khalil, A** 2019. *Greenland Marine Glacier Terminus Mapping in Satellite Imagery using the Automated 2D Wavelet Transform Modulus Maxima (WTMM) Segmentation Method*. American Geophysical Union Fall Meeting, San Francisco, CA.

61. Liu, J, Enderlin, EM, **Khalil, A** 2019. *Investigating Changes to Greenland's Peripheral Marine-Terminating Glaciers Through Automated Analysis of Satellite Imagery*. University of Maine Climate Change Institute 2019 Annual Meeting.

62. Mills, KD, Cyr, A, Maclay, T, Day, M, Hasham, MG, **Khalil, A** 2017. *A small molecule RAD51 inhibitor preferentially affects cells expressing high cytidine deaminase activity*. American Society of Hematology 59th Annual Meeting & Exposition, Atlanta, GA.

63. Garrett, AM, Tadenev, ALD, **Khalil A**, Fuerst, PG, Burgess RW 2016. *Dscam promotes self-avoidance in neurodevelopment by masking diverse cell adhesion molecules*. Annual Meeting of the Society for Neuroscience: San Diego, CA.

64. Garrett, AM, Tadenev, ALD, **Khalil, A**, Fuerst, PG, Burgess, RW 2015. *Dscams promote self-avoidance by masking adhesion through both PDZ-dependent and –independent mechanisms.* Annual Meeting of the Society for Neuroscience: Chicago, IL.

65. Burgess, RW, Garrett, AM, Tadenev, ALD, **Khalil, A**, Fuerst, PG 2014. *Dscams promote self-avoidance by masking adhesion through both MAGI-dependent and –independent mechanisms*. Annual Meeting of the Society for Neuroscience: Washington, DC.

66. Richard, CD, **Khalil, A**, Frankel, W 2013. Novel computational approach to detect absence seizures in mutant mouse strains. Annual Meeting of the Society for Neuroscience: San Diego, CA.

67. Kestener, P, **Khalil, A**, Arneodo, A 2010. *A continuous wavelet-based segmentation tool to analyze multifractal properties of quiet and active regions from solar magnetogram data*. In ADA6, Astronomical Data Analysis Conference, Monastir, Tunisia.

68. Wu, Y, Batuski, D, **Khalil, A** 2010. *Properties of Density Field Clusters from the SDSS*, Bulletin of the American Astronomical Society, 42, 385.

69. Wu, Y, Batuski, D, **Khalil, A** 2009. *Application of the Metric Space Technique in 2D and 3D to SDSS DR5*, Bulletin of the American Astronomical Society, 41, 449.

70. Wu, Y, Batuski, D, **Khalil, A** 2007. *New statistical methods to analyze the Sloan Digital Sky Survey Data*, Joint New England Sections of the American Physics Society and AAPT Spring Meeting.

71. Wu, Y, Batuski, D, **Khalil, A** 2007. *New Statistical Methods to Determine the Fractal Dimension of Structures Evident in the SDSS, WMAP, and 2MASS Surveys*, Bulletin of the American Astronomical Society, 39, 804.

72. Wu, Y, Batuski, D, & **Khalil, A** 2006. *New statistical methods to analyze the SDSS DR5 galaxy distribution*, Bulletin of the American Astronomical Society, 38, 1000.

Industry Reports

73. **Khalil, A**, Mason, MD 2008. *Image Analysis of Soft-Tissue In-Growth into Artificial Bone Implants: Part II: PSF and SLM Implants*, Stryker Orthopaedics, (4 pages).

74. **Khalil, A**, Mason, MD 2006. *Image Analysis of Soft-Tissue In-Growth into and Attachment to Alumina Ceramic Foam for Canines*, Stryker Orthopaedics, (14 pages).

Data sets

75. Liu, J, Enderlin, E, **Khalil, A**, Marshall, HP 2021 *Dataset for Time Series of Terminus Position for Glaciers Along the Periphery of Southeast Greenland* [Data set]. https://doi.org/10.18122/cryogars_data.1.boisestate

Theses Advised

Doctoral Theses

1. Wu, Yongfeng, Ph.D. Astrophysics 2010. '*Multi-Scale Three-Dimensional Analysis of Galaxy Distributions Using the Metric Space Technique*' (Co-Chair).

2. Richard, Christian, Ph.D. Functional Genomics 2014. '*Novel Computational Approaches to Detect and Characterize Absence Seizures in Seizure-Prone Mutant Mouse Strains*' (Co-Chair).

3. Toner, Brian, Ph.D. Computer Science and Spatial Information 2019. '*3D Modeling of Tumor Onset and Development in Simulated Breast Tissue'.*

4. Batchelder, Kendra, I.Ph.D. Computational Biomedicine 2023 (expected). '*Longitudinal analysis of mammographic microenvironment tissue disruption accompanying tumorigenesis*'.

5. Seekins, Tyler, Ph.D. Chemical Engineering 2023 (expected). '*Computer vision for paper fiber quantification*'. (Co-chair with Dr. Douglas Bousfield).

6. Juybari, Jeremy, Ph.D. Electrical and Computer Engineering 2024 (expected). '*Computational analysis of patient-matched mammogram and pathological tissue samples*'. (Co-chair with Dr. Yifeng Zhu).

7. Miner, Jordan, Ph.D. Biomedical Engineering 2025 (expected). '*Quantitative imaging of culture and native breast tissue sample'*. (Co-chair with Dr. Karissa Tilbury).

8. Joshua Hamilton, Ph.D. Biomedical Engineering 2026 (expected). '*Multiscale anisotropy analysis of cancer microenvironment tissue*'.

Masters Theses

9. Wu, Yongfeng, M.S. Astrophysics 2007. '*New Statistical Methods to Get the Fractal Dimension of Bright Galaxies Distributions from the Sloan Digital Sky Survey Data*' (Co-Chair).

10. Robitaille, Jean-Francois, M.S. Astrophysics 2008. '*Analyse Metrique de Structure HI dans le Plan Galactique*' (Co-Chair at Université Laval, QC, Canada).

11. Grant, Jeremy, M.A. Mathematics 2008. '*Wavelet-Based Segmentation of Fluorescence Microscopy Images in Two and Three Dimensions*'.

12. Potter, Matthew, M.A. Mathematics 2010. '*Prime Modulo and Pascal's Triangle As Seen With Fractal Geometry*'.

13. Mooers, Kendra, M.A. Mathematics 2013. '*Characterization of Mammographic Breast Lesions And Their Microenvironment: An Application of a Wavelet-Based Multifractal Formalism*'.

14. Cox, Derrick, M.A. Mathematics 2014. '*Computational Analysis of Mammographic Breast Tissue Using the Metric Space Technique*'.

15. Toner, Brian, M.A. Mathematics 2015. '*The Geometric Properties of Cells Exhibiting Huntington's Disease*'.

16. Connerty-Marin, Zachary, M.A. Mathematics 2017. '*Automated tracking of marine extremophiles from 3D digital holographic microscopy'.*

17. Juybari, Jeremy, M.A. Mathematics 2020. '*Wavelet leaders and p-leaders analysis of loss of tissue homeostasis in mammographic tumor microenvironment'.*

18. Liu, Julia, M.S. Earth Sciences 2020. '*Automated Terminus Detection For Greenland's Peripheral Marine-Terminating Glaciers'.* (Co-chair with Dr. Ellyn Enderlin)
19. Varney, Hannah, M.S. Biomedical Engineering 2021. '*Segmentation and Statistical Analysis of Imaged and Simulated 3D Chromosome Territories*'.

20. Jarvis, Katherine, M.S. Biochemistry 2021. '*Mathematical modeling of signaling pathways in yeast'*. (Co-chair with Dr. Josh Kelley)

21. Hamilton, Josh, M.S. Biomedical Engineering 2022. '*Anisotropy analysis of collagen architecture in pancreatic and breast tumor tissue slides.'* (Co-chair with Dr. Karissa Tilbury)

22. Raza, Madison, M.S. Biomedical Engineering 2023 (expected). '*Mammographic tissue microenvironment assessment using the Metric Space Technique*'.

23. McCarthy, Margaret, M.S. Biomedical Engineering 2023 (expected). '*Quantitative visualization of mammographic tissue microenvironment disruption*'.

24. White, Basel, M.S. Biomedical Engineering 2023 (expected). '*Power spectral analyses of mammographic tissue microenvironment'*.

<u>Honors Theses</u>

25. Dewey, Hannah, B.A. Honors Mathematics 2014. '*Wavelet-Based Multifractal Analysis of Brain Images*'.

26. Ossanna, Elliot, B.A. Honors Mathematics 2015. '*Fractal Dimension of Residues Sets Within Pascal's Triangle Under Square-Free Moduli*'.

27. Plourde, Shayne, B.A. Honors Mathematics 2015. '*Modeling the Growth of Breast Microcalcifications in Mathematically-Generated Breast Tissue Environments Using an Agent-Based Model*'.

28. Canning, Dexter, B.A. Honors Mathematics 2019. '*Wavelet-Based Mammographic Analysis of Normal and Tumorous Tissue Microenvironment*'.

29. Abay, Betelhem, B.S. Biomedical Engineering 2020. '*Exploration of The Relationship Between The Fractal Dimension Of Microcalcification Clusters And The Hurst Exponent Of Background Tissue Disruption In Mammograms*.

30. White, Basel, B.S. Biomedical Engineering 2021. '*Automated segmentation of breast tissue from mammograms*.'

Patents

1) U.S. Patent 10,769,790 B2 *Methods of Cancer Detection.* Awarded: 09/08/2020

2) U.S. Patent 10,467,755 B2 *Methods of Cancer Detection.* Awarded: 11/05/2019

Oral Presentations

Keynote and Invited Seminars & Presentations:

1. November 2022: IDEXX – UMaine Research Exchange, Idexx Laboratories, Westbrook, ME
   Invited talk: *Imaging software for cancer risk assessment*

2. July/August 2021: EXPLO: Learning Through Exploration, Colby College, Waterville, ME
   Invited talks (set of 3 talks): *From Mathematics, to Astrophysics, to Biomedicine: A 25-year Journey in 1 Hour.*

3. June 2021: Laboratoire Ondes et Matieres d'Aquitaine, Universite de Bordeaux, France
   Invited talk: *Loss of mammographic tissue homeostasis in breast carcinomas*

4. January 2021: Bioscience Association of Maine (BIOME) Virtual Coffee Hour
   Invited talk: *Novel computational technology to pre-detect breast cancer:Moving towards commercialization*

5. October 2020: SFtools-bigdata: The close structural connection between gas and young stars focus on current and new tools of data analysis, Université Grenoble Alpes, France
   Invited talk: *Overview of applications of the 2D Wavelet Transform Modulus Maxima method*

6. March 2020: National Cancer Institute, Div. of Cancer Epidemiology and Genetics, Rockville, MD
   Invited talk: *Characterization of loss of tissue homeostasis in mammographic breast tumor microenvironment*

7. November 2019: UMaine Medicine Microscopy Symposium
   Invited talk: *Image analysis for x-ray, 3D holography, DIC, confocal, widefield, 2-photon fluorescence and Second Harmonic Generation Microscopies*

8. October 2019: The Jackson Laboratory Seminar Series
   Invited talk: *Computational Engineering at CompuMAINE*

9. September 2019: IDEXX Artificial Intelligence / Machine Learning Annual Symposium, IDEXX Laboratories, Westbrook, ME
   Keynote talk: *Loss of tissue homeostasis in breast tumor microenvironment*

10. January 2019: Centre de Recherche Mathématiques, Université de Montréal, QC, Canada
    Invited talk: *Loss of tissue homeostasis in breast tumor microenvironment*

11. January 2019: Linguistique des Rives, École Secondaire de Terrebonne, QC, Canada
    Invited talk: *From Mathematics, to Astrophysics, to Biomedicine: A 25-year Journey in 3 Hours.*

12. November 2018: Pi Mu Epsilon Career Day, University of Maine, Orono, ME

Invited talk: *A career as an applied mathematician*

13. April 2017: UMaine Marches for Science, University of Maine, Orono, ME
Invited speech: *The Need for Fundamental Science*

14. January 2016: Department of Chemical/Biological Engineering, University of Maine, Orono, ME
Invited talk: *Fractal Analysis of Mammographic Breast Lesions and Characterization of Loss of Tissue Homeostasis in Tumor Microenvironment*

15. January 2016: Landmark College, Putney, VT
Invited talk: *The CompuMAINE Laboratory: Overview of Past and Current Activities*

16. November 2015: Department of Physics and Astronomy, University of Maine, Orono, ME
Invited Talk: *Fractal Analysis of Mammographic Breast Lesions and Characterization of Loss of Tissue Homeostasis in Tumor Microenvironment*

17. February 2015: Graduate School of Biomedical Sciences and Engineering, University of Maine, Orono, ME
Invited Talk: *The CompuMAINE Laboratory*

18. May 2013: Maine Cancer Consortium Annual Meeting, Jackson Laboratory, Bar Harbor, ME
Panel Discussion: *Cutting-Edge Cancer Research in Maine* (invited as one of four cancer research experts from Maine)

19. November 2012: Ecole Normale Superieure de Lyon, France
Invited Talk: *Breast Cancer and Leukemia: On-Going Projects From The CompuMAINE Lab*

20. August 2012: Signal Processing and Image Analysis Interest Group, The Jackson Laboratory, Bar Harbor, ME
Invited Talk: *Fractals in Mammograms and Wavelets in Chromosomes: Signal Processing, Image Analysis and Modeling*

21. April 2012: University of Maine School of Biology and Ecology Colloquium Series
Invited Talk: *Fractals in Mammograms and Wavelets in Chromosomes*

22. April 2012: Maine Biological and Medical Scientific Symposium, Salisbury Cove, ME
Invited Talk: *Biomedical Image and Signal Processing, Analysis, and Modeling*

23. November 2011: Medical Research Council, Imperial College London, England
Invited Talk: Computational Analysis of Chromosome Territories

24. November 2011: Kirchhoff Institute for Physics, University of Heidelberg, Germany
Invited Talk: 3D Modeling of Chromosome Territories

25. June 2011: Maine Cancer Foundation Annual Meeting, Portland, ME
Invited Presentation Display: *Breast Cancer: Wavelet-Based Image Analysis of Mammograms*
Invited Presentation Display: *Computational Pathology: 3D Structure of Chromosome Territories during Progression to Malignancy*

26. August 2010: SuperMe: UMaine Research Experience for Undergraduates, Orono, ME

Invited Talk: *Fractals and Wavelets*

27. June 2009: Maine Cancer Foundation Annual Meeting, Portland, ME
Invited Presentation Display: *Breast Cancer: Wavelet-Based Image Analysis of Mammograms*

28. November 2008: The Jackson Laboratory, Bar Harbor, ME
Invited Talk: *Signal Processing and Image Analysis with the WTMM Method*

29. June / July 2008: Graduate School of Mathematical and Computational Methods for the Sciences, University of Heidelberg, Germany
Invited Seven-Part Lecture Series (14 hours): *The Wavelet Transform Modulus Maxima Method: Image Analysis Lecture Series*

30. July 2008: Kirchhoff Institute for Physics, University of Heidelberg, Germany
Invited Talk: *Wavelet-Based Characterization of Chromosome Territories*

31. July 2008: Laboratoire Joliot-Curie, Ecole Normale Superieure de Lyon, France
Invited Talk: *Morphological Analysis of Slow and Fast Muscle Cells in Zebrafish Embryos*

32. June 2008: Department of Appied Physical Chemistry, University of Heidelberg, Germany
Invited Talk: *Image Analysis with the Wavelet Transform Modulus Maxima Method*

33. May 2008: Pizza Pi, Department of Mathematics, University of Maine, Orono, ME
Invited Talk: *Building a bridge to nowhere and everywhere*

34. May 2008: First Annual Meeting of the Graduate School of Biomedical Sciences, University of Maine, Orono, ME
Invited Talk: *Breast Cancer: Wavelet-Based Characterization of Microcalcification Clusters*

35. March 2008: Department of Radiology, University of California, San Francisco, CA
Invited Talk: *Wavelet-Based Image Analysis*

36. October 2007: McGill University, Department of Biomedical Engineering, Montreal, Canada
Invited Talk: *Wavelet-Based Characterization of Chromosome Territories*

37. May 2007: Functional Imaging of the Cell Nucleus, Lyon, France
Keynote Talk: *Wavelet-Based Characterization of Chromosome Territories*

38. August 2005: Third Annual Meeting of the NSF - IGERT Functional Genomics Ph.D. Program, University of Maine, Orono, ME
Invited talk: *2D and 3D Signal Processing Tools for Bio-Medical Image Analysis*

39. March 2005: Department of Mathematics and Statistics, University of Maine
Invited talk: *Wavelets and Fractals: From Astrophysics to Bio-Medical Image Analysis*

40. February 2005: Department of Physics and Astronomy, University of Maine
Invited talk: *Wavelets and Fractals: From Astrophysics to Bio-Medical Image Analysis*

41. January 2005: Department of Spatial Information Science and Engineering, University of Maine
Invited talk: *Wavelets and Fractals: From Astrophysics to Bio-Medical Image Analysis*

42. November 2000: International Symposium on the Applications of Fractal Techniques in Biology and Medicine, Montréal, Canada
Invited talk: Morphological Analysis of Molecular Clouds: A Multi-Tool Analysis

Other Presentations

43. November 2022: Annual Meeting of the Radiological Society of North America, Chicago, IL.
Oral talk: *Computational Assessment of Healthy vs. Risky Mammographic Breast Density*.

44. September 2022. Why Study Mammographic Density?, Melbourne, Australia.
Oral talk: *Quantitative Visualization of Healthy vs. Risky Mammographic Breast Density*.

45. December 2019: San Antonio Breast Cancer Symposium, San Antonio, TX
Poster: *Exploratory computational longitudinal analysis of mammographic microenvironment disruption preceding breast tumorigenesis*.

46. April 2019: 46th Maine Biological and Medical Sciences Symposium, MDI Laboratory, ME
Poster: The CompuMAINE Laboratory

47. April 2017: 44rd Maine Biological and Medical Sciences Symposium, MDI Laboratory, ME
Poster: *Wavelet-Based Particle Tracking in Unreconstructed, Off-Axis Holograms*

48. April 2016: 43rd Maine Biological and Medical Sciences Symposium, MDI Laboratory, ME
Talk: The CompuMAINE Lab

49. September 2012: Department of Physics and Astronomy, University of Maine, Orono, ME
Talk: *The CompuMAINE Laboratory*

50. April 2012: Maine Biological and Medical Scientific Symposium, Salisbury Cove, ME
Poster: *SWDfinder: A Computational Tool for the Detection of Absence Seizures in Seizure-Prone Mice*. **Poster**: *Successful Discrimination Between Benign vs. Malignant Breast Lesions Using a Wavelet-Based Multifractal Method*. **Poster**: *3D Structural Analysis and Modeling of Chromosome Territories*

51. March 2012: University of Maine Graduate School of Biomedical Sciences Student Reception, Orono, ME
Talk: *Computational Image Processing in Biomedicine.*

52. September 2010: University of Maine Graduate School of Biomedical Sciences Annual Meeting, Orono, ME
Poster: *Probabilistic Modeling of 2D Foci Counts with Respect to Radial Distribution*
Poster: *Enhanced 3D Segmentation of Fluorescence Microscopy Images*

53. February 2010: University of Maine Graduate School of Biomedical Sciences Student Reception, Orono, ME
Poster: *Pore size and morphology modulate patterning of soft-tissue in-growth into porous titanium implants based on novel imaging tools*
Poster: *2D and 3D Signal Processing Tools for Bio-Medical Image Analysis*

54. February 2010: University of Maine Graduate School of Biomedical Sciences Student Reception, Orono, ME
Poster: *Pore size and morphology modulate patterning of soft-tissue in-growth into porous titanium implants based on novel imaging tools*
Poster: *2D and 3D Signal Processing Tools for Bio-Medical Image Analysis*

55. September 2009: University of Maine Graduate School of Biomedical Sciences Annual Meeting, Orono, ME
Poster: *Pore size and morphology modulate patterning of soft-tissue in-growth into porous titanium implants based on novel imaging tools*
Poster: *2D and 3D Signal Processing Tools for Bio-Medical Image Analysis*

56. August 2009: Nano and Micro Technology Workshop, Mount Desert Island Biological Lab, Salisbury Cove, ME
Talk: *Multifractal analysis of actigraphy signals*

57. June 2009: Physics of Complexity, Ecole Normale Superieure de Lyon, France
Poster: *Pattern of soft-tissue in-growth into porous implants based on novel imaging tools*
Poster: *Pore size and morphology modulate patterning of soft-tissue in-growth into porous titanium implants based on novel imaging tools*
Poster: *2D and 3D Signal Processing Tools for Bio-Medical Image Analysis*

58. March 2009: 55th Annual Orthopaedic Research Society Meeting, Las Vegas, NV
Poster: *Pore size and morphology modulate patterning of soft-tissue in-growth into porous titanium implants based on novel imaging tools*

59. March 2008: 54th Annual Orthpaedic Research Society Meeting, San Francisco, CA
Poster: *Pattern of soft-tissue in-growth into porous implants based on novel imaging tools*

60. February 2008: Institute for Molecular Biophysics Annual Meeting, Bar Harbor, ME
Poster: *Enhanced 3D Segmentation of Fluorescence Images*

61. February 2008: Institute for Molecular Biophysics Annual Meeting, Bar Harbor, ME
Talk: *Biomedical Image Analysis and Modeling*

62. June 2007: Frontiers in Microscopy II: Imaging From Single Molecules to Whole Organisms and Its Application, Bar Harbor, ME
Poster: *2D and 3D Signal Processing Tools for Bio-Medical Image Analysis*

63. March 2007: Frontiers in Probe Development, Bar Harbor, ME
Poster: *2D and 3D Signal Processing Tools for Bio-Medical Image Analysis*

64. July 2006: Fourth Annual Meeting of the NSF - IGERT Functional Genomics Ph.D. Program, University of Maine, Orono, ME
Poster: *2D and 3D Signal Processing Tools for Bio-Medical Image Analysis*

65. July 2006: Frontiers in Microscopy, Bar Harbor, ME
Poster: *2D and 3D Signal Processing Tools for Bio-Medical Image Analysis*

66. March 2006: Frontiers in Biomembranes: Experiments and Theory, Bar Harbor, ME
Poster: *2D and 3D Signal Processing Tools for Bio-Medical Image Analysis*

67. September 2005: Annual Scientific Advisory Board Meeting for the Institute for Molecular Biophysics, The Jackson Laboratory, Bar Harbor, ME
Talk: *On the Development and Use of Rigorously Well-Defined, Quantitative, and Objective Image Analysis Tools: Keeping Up With Technological Advancements*

68. May 2005: International Galactic Plane Survey Consortium (IGPS) Meeting, Toronto, Canada
Talk: *Fractals & Wavelets: New Projects and Early Results*

69. May 2004: International Galactic Plane Survey Consortium (IGPS) Meeting, Penticton, Canada
Talk: Wavelet-Based Multifractal Formalism: Anisotropy… at all scales

70. March 2004: Scientific Meeting of the Centre de recherche de l'Observatoire du Mont-Mégantic, Lac-Estérel, QC, Canada
Talk: Modélisation de la structure anisotrope du HI à grande échelle

71. September 2003: Annual Meeting of the Québec Astrophysics Graduate Students from Universities Laval, McGill, and de Montréal, Montréal, Canada
Talk: Analyse de la structure du milieu interstellaire

72. June 2003: Society of Industrial and Applied Mathematics (SIAM) meeting, Montréal, Canada
Talk: Morphological Analysis of Galactic Neutral Hydrogen

73. May 2003: Association Francophone pour l'Avancement des Sciences (ACFAS) 76th Annual Meeting, Rimouski, QC, Canada
Talk: Analyse de la structure du milieu interstellaire. **Poster**: L'introduction du spectre de mesures de Hausdorff pour la caractérisation de structures de même dimension fractale

74. April 2003: International Galactic Plane Survey Consortium (IGPS) Meeting, Québec, Canada
Talk: Morphological Analysis of Galactic Neutral Hydrogen

75. March 2003: Scientific Meeting of the Centre de recherche de l'Observatoire du Mont-Mégantic, Lac-Delage, QC, Canada
Talk: Analyse morphologique de l'hydrogène neutre à grande échelle

76. September 2002: Annual Meeting of the Québec Astrophysics Graduate Students from Universities Laval, McGill, and de Montréal, Montréal, Canada
Talk: Analyse morphologique de l'hydrogène neutre

77. March 2002: Fractal 2002, Complexity and Fractals in Nature 7th Interdisciplinary Conference, Grenada, Spain
Poster: Morphological Analysis of Astrophysical Clouds

78. October 2001: « Seeing Through the Dust » International Conference, Penticton, BC, Canada
Talk: Exotic Tools for the Morphological Analysis of Neutral Hydrogen Clouds

79. September 2001: Annual Meeting of the Québec Astrophysics Graduate Students from Universities Laval, McGill, and de Montréal, Québec, Canada
Talk: Multifractales et Ondelettes