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Professional Preparation

State University of NY - Oswego	Biology	B.S., 1989
Michigan State University	Botany & Plant Pathology	Ph.D., 1993
Visiting Research Scientist, Central Research and Development, DuPont Co.		Post-Doc. 1993-1994

Appointments

2022 - 2023 Chief Technology Officer, Co-Founder, Board of Directors, Peptide Bio (start-up), St. Louis, MO (company sold to Invaio Sciences, 12/23)

2020 - present Affiliated Faculty, Department of Biology, Saint Louis University, St. Louis, MO
Appointment as external faculty to support collaborative funding, teaching and student training initiatives.

2019 - present Director Advanced Bioimaging Laboratory, Principal Investigator, Donald Danforth Plant Science Center, St. Louis, MO - Responsible for day-to-day operation of EM/LM microscopy center, apply and develop advanced plant-related microscopy techniques, support and seek internal and external funding.

2016 – 2019 Vice President Global ZEISS Microscopy Customer Centers, Carl Zeiss Microscopy – Responsible for Global applications team, customer demonstration and training centers, strategic inventory, and stakeholder for product portfolio roadmap.

2015 – 2016 Global Coordinator ZEISS Microscopy Labs, Carl Zeiss Microscopy - Coordinated activities of (10) Global Customer Centers with Application Teams

2012 – 2016 Director of North American Applications and Labs, Carl Zeiss Microscopy - Responsible for US applications team, (2) customer demonstration and training centers for product portfolio.

2009 – 2012 Associate Professor (primary appt.), Department of Biological Sciences, University of Delaware - Responsible for day-to-day operation of UD Bio-Imaging Center, teaching and seeking/support for internal/external funding.

2010 – 2012 Associate Professor (secondary appt.), Department of Plant and Soil Sciences, University of Delaware – Collaboration, teaching and research with Plant and Soil Sciences Department Faculty

2001 – 2012 Director, Bio-Imaging Center, Delaware Biotechnology Institute, University of Delaware - Responsible for day-to-day operation of EM/LM/AFM microscopy center and Center for Translational Cancer Research Core Facility

2000 – 2009 Associate Professor (secondary appt.), Department of Biological Sciences, University of Delaware - Collaboration, teaching and research with Department of Biological Sciences Faculty.

1996 – 2001 Laboratory Coordinator, Microscopy Facility, University of Delaware - Responsible for day-to-day operation of EM/LM Core Facility

1994 – 1996 Applications Scientist, Confocal Business Unit, NORAN Instruments, Inc
Applications, demonstrations and training with high-speed confocal microscopy

Awards and Honors Professional Memberships:

1992	Microscopy Society of America - Boston, MA, Presidential Scholar Award
1992	Mycological Society of America - Portland, OR, Mycological Society Graduate Fellowship Award
1992	Phi Kappa Phi - Honor Society
1991	Microscopy Society of America - San Jose, CA, Student Traveling Poster Exhibit

1990	Mycological Society of America - Madison, WI, Outstanding Poster Award
1989	Great Lakes Electron Microscopy Association - Novi, MI, Outstanding Poster Award
1989	Senior Honors Thesis in Biology
1989	Outstanding Senior in Biology Award
1988	Sheldon Scholar Award
1988	Martin Toroq Award for Outstanding Undergraduate Research in Biology
1986	Phi Eta Sigma - Freshman Honor Society
2008	Research Council- University of Delaware
2009	NIH Shared Instrumentation Grant Ad Hoc Member
2010	Nikon Small World Contest Honorable Mention
2010	Strategic Planning Committee – College of Arts and Sciences – UD
2013	NIH INBRE Outstanding Contribution Award –UD
2016-2019	M2 and M3 Global Management Team, ZEISS Microscopy

Publications (120+)

1. **Czymmek, K.J.**, Belevich, I, Bischof, J., Mathur, A., Collinson, L. and Jokitalo, E., 2024. Accelerating data sharing and re-use in volume electron microscopy. *Nature Cell Biology*. Accepted.
2. Morone, N., Martin, M.G., Goggin, P., **Czymmek, K.J.**, Mennella, V. and Gonzalez, J.L., 2023. A Novel Sandwich Method for Serial Block Face SEM Imaging of Airway Multiciliated Epithelium. In *Cilia: Methods and Protocols* (pp. 121-129). New York, NY: Springer US.
3. Tetorya, M., Li, H., Djami-Tchatchou, A.T., Buchko, G.W., **Czymmek, K.J.** and Shah, D.M., 2023. Plant defensin MtDef4-derived antifungal peptide with multiple modes of action and potential as a bio-inspired fungicide. *Molecular Plant Pathology*.
4. **Czymmek, K.J.**, Duncan, K.E. and Berg, H., 2023. Realizing the Full Potential of Advanced Microscopy Approaches for Interrogating Plant-Microbe Interactions. *Molecular Plant-Microbe Interactions*, 36(4), pp.245-255.
5. Wickramanayake, J.S. and **Czymmek, K.J.**, 2023. A conventional fixation volume electron microscopy protocol for plants. *Methods in Cell Biology*, 177, pp.83-99.
6. Cox Jr, K.L., Gurazada, S.G.R., Duncan, K.E., **Czymmek, K.J.**, Topp, C.N. and Meyers, B.C., 2022. Organizing your space: The potential for integrating spatial transcriptomics and 3D imaging data in plants. *Plant Physiology*, 188(2), pp.703-712.
7. Chu, K.L., Koley, S., Jenkins, L.M., Bailey, S.R., Kambhampati, S., Foley, K., Arp, J.J., Morley, S.A., **Czymmek, K.J.**, Bates, P.D. and Allen, D.K., 2022. Metabolic flux analysis of the non-transitory starch tradeoff for lipid production in mature tobacco leaves. *Metabolic engineering*, 69, pp.231-248.
8. Duncan, K.E., **Czymmek, K.J.**, Jiang, N., Thies, A.C. and Topp, C.N., 2022. X-ray microscopy enables multiscale high-resolution 3D imaging of plant cells, tissues, and organs. *Plant physiology*, 188(2), pp.831-845.
9. Zhang, N., Mattoon, E.M., McHargue, W., Venn, B., Zimmer, D., Pecani, K., Jeong, J., Anderson, C.M., Chen, C., Berry, J.C., **Czymmek, K.J.** and Xia, M., 2022. Systems-wide analysis revealed shared and unique responses to moderate and acute high temperatures in the green alga *Chlamydomonas reinhardtii*. *Communications Biology*, 5(1), pp.1-24.
10. **Czymmek, K.J.**, 2022. Tips and Tricks for Volume Electron Microscopy Workflows in Plants. *Microscopy and Microanalysis*, 28(S1), pp.1456-1456.
11. Belanger, S., Heather, H., Baena, V., Duncan, K., Narayan, K., Meyers, B.C. and **Czymmek, K.J.**, 2022. A versatile enhanced freeze-substitution protocol for volume electron microscopy. *Frontiers in cell and developmental biology*, p.1555.
12. Zhang, N., Pazouki, L., Nguyen, H., Jacobshagen, S., Bigge, B.M., Xia, M., Mattoon, E.M.,

- Klebanovych, A., Sorkin, M., Nusinow, D.A., **Czymmek, K.J.** and Avasthi, P., 2022. Comparative Phenotyping of Two Commonly Used *Chlamydomonas reinhardtii* Background Strains: CC-1690 (21gr) and CC-5325 (The CLiP Mutant Library Background). *Plants*, 11(5), p.585.
13. Kim, H.S., Park, S.Y., Kang, S. and **Czymmek, K.J.**, 2022. Time-Lapse Imaging of Root Pathogenesis and Fungal Proliferation Without Physically Disrupting Roots. In *Fusarium wilt* (pp. 153-170). Humana, New York, NY.
 14. Cox Jr, K. L., Manchego, J., Meyers, B. C., **Czymmek, K. J.**, & Harkess, A. (2022). Automated imaging of duckweed growth and development. *Plant Direct*, 6(9), e439.
 15. Anderson, C.M., Mattoon, E.M., Zhang, N., Becker, E., McHargue, W., Yang, J., Patel, D., Dautermann, O., McAdam, S.A., Tarin, T., **Czymmek, K.J.** and Pathak, S., 2021. High light and temperature reduce photosynthetic efficiency through different mechanisms in the C4 model *Setaria viridis*. *Communications biology*, 4(1), pp.1-19.
 16. Kim, H.S., Kim, J.E., Hwangbo, A., Akerboom, J., Looger, L.L., Duncan, R., Son, H., **Czymmek, K.J.** and Kang, S., 2021. Evaluation of multi-color genetically encoded Ca²⁺ indicators in filamentous fungi. *Fungal Genetics and Biology*, 149, p.103540.
 17. Gurazada, S.G.R., Cox Jr, K.L., **Czymmek, K.J.** and Meyers, B.C., 2021. Space: the final frontier—achieving single-cell, spatially resolved transcriptomics in plants. *Emerging Topics in Life Sciences*, 5(2), pp.179-188..
 18. Harkess, A., McLoughlin, F., Bilkey, N., Elliott, K., Emenecker, R., Mattoon, E., Miller, K., **Czymmek, K.**, Vierstra, R., Meyers, B.C., Michael, T.P. (2021). Improved *Spirodela polyrhiza* genome and proteomic analyses reveal a conserved chromosomal structure with high abundance of chloroplastic proteins favoring energy production. *Journal of Experimental Botany*, 72(7), 2491-2500.
 19. Kim, H.S., Park, S.Y., Kang, S., **Czymmek, K.** 2021. Time-lapse imaging of root pathogenesis without physical disruption to study the mechanism of *Arabidopsis thaliana*-*Fusarium oxysporum* interactions. *Methods in Molecular Biology*. Springer Science+Business Media LLC. **In Press**.
 20. Chu, K., Jenkins, L.M., Bailey, S.R., Kambhampati, S., Koley, S., Foley, K., Arp, J.J., **Czymmek, K.J.**, Bates, P.D. and Allen, D.K., 2020. Shifting carbon flux from non-transient starch to lipid allows oil accumulation in transgenic tobacco leaves. *BioRxiv*.
 21. Liu, Z., Nguyen, Q.P.H., Nanjundappa, R., Delgehyr, N., Megherbi, A., Doherty R., Thompson, J., Jackson, C., Albulescu, A., Heng, Y.M., Lucas, J.S., Dell, S.D., Meunier, A., **Czymmek, K.**, Mahjoub, M.R., Mennella, V. 2020. Super-Resolution Microscopy and FIB-SEM Imaging Reveal Parental Centriole-Derived, Hybrid Cilium in Mammalian Multiciliated Cells. *Developmental Cell*, 55(2): 224-236. <https://doi.org/10.1016/j.devcel.2020.09.016>
 22. Bélanger, S., Pokhrel S., **Czymmek K.**, Meyers, B.C. 2020. Pre-meiotic, 24-nt reproductive phasiRNAs are abundant in anthers of wheat and barley but not rice and maize. *Plant Physiol.* Vol. 184:1407–1423. <https://doi.org/10.1104/pp.20.00816>
 23. **Czymmek, K.**, Sawant, A., Goodman, K., Pennington, Pedersen, P., Hoon, M., Otegui, M.S. 2020. Imaging Plant Cells by High-Pressure Freezing and Serial block-face scanning electron microscopy. In: Otegui M. (eds) *Plant Endosomes*. *Methods in Molecular Biology*, vol 2177. Humana, New York, NY. https://doi.org/10.1007/978-1-0716-0767-1_7
 24. Velivelli, S., **Czymmek, K.J.**, Li, H., Shaw, J.B., Buchko, Q.W., Shah, D.M., 2020. Antifungal symbiotic peptide NCR044 exhibits unique structure and multifaceted mechanisms of action that confer plant protection. *Proceedings of the National Academy of Sciences* Jul 2020, 117 (27) 16043-16054
 25. Wu, G.H., Mitchell PG, Galaz-Montoya JG, Hecksel CW, Sontag EM, Gangadharan V, Marshman J, Mankus D, Bisher ME, Lytton-Jean AK, Frydman J., **Czymmek, K.**, Chiu, W. 2020. Multi-Scale 3D Cryo-Correlative Microscopy for Vitri-fied Cells. *Structure*. 28(11): 1231-1237.e3

26. Kim, H.-S., Kim, J.-E., Son, H., Frailey, D., Cirino, R., Lee, Y.-W., Duncan, R., **Czymmek, K.J.**, Kang, S. 2018. Roles of three *Fusarium graminearum* membrane Ca²⁺ channels in the formation of Ca²⁺ signatures, growth, development, pathogenicity and mycotoxin production. *Fungal Genetics and Biology*. 111:30-46.
27. Huang, K., Caplan, J., Sweigard, J.A., **Czymmek, K.J.**, Donofrio, N.M. 2017. Optimization of the HyPer sensor for robust real-time detection of hydrogen peroxide in the rice blast fungus. *Molecular plant pathology*. 18(2):298-307.
28. Dahms, T.E.S., **Czymmek, K.J.** 2015. *Advanced Microscopy in Mycology*. T.E.S. Dahms and K.J. Czymmek (eds.), Fungal Biology, Springer International Publishing Switzerland.
29. **Czymmek K.J.**, Dahms TES. 2015. Future Directions in Advanced Mycological Microscopy. In: *Advanced Microscopy in Mycology*. Eds T.E.S. Dahms and K. Czymmek. Fungal Biology, Springer International Publishing Switzerland. Pp 143-162.
30. Sydor, A.M., **Czymmek, K.J.**, Puchner, E.M., Mennella, V. 2015. Super-Resolution Microscopy: From Single Molecules to Supramolecular Assemblies. *Trends in cell biology*. 25(12):730-48.
31. Caplan, J.L., Kumar, A.S., Park, E., Padmanabhan, M.S., Hoban, K., Modla, S., **Czymmek, K.**, Dinesh-Kumar, S.P. 2015. Chloroplast Stromules Function during Innate Immunity. *Developmental cell*. 34(1):45-57.
32. Modla, S., Caplan, J.L., **Czymmek, K.J.**, Lee, J.Y. 2015. Localization of fluorescently tagged protein to plasmodesmata by correlative light and electron microscopy. *Methods in molecular biology* (Clifton, N.J.). 1217:121-33.
33. Gangadharan, V., Nohe, A., Caplan, J., **Czymmek, K.**, Duncan, R.L.. 2015. Caveolin-1 regulates P2X7 receptor signaling in osteoblasts. *American journal of physiology. Cell physiology*. 308(1):C41-50.
34. Cao T, Zach C, Modla S, Powell D, **Czymmek K**, 2014. Niethammer M. Multi-modal registration for correlative microscopy using image analogies. *Medical image analysis*. 18(6):914-26.
35. Gardinier J, Yang W, Madden GR, Kronbergs A, Gangadharan V, Adams E, **Czymmek K**, Duncan RL. 2014. P2Y2 receptors regulate osteoblast mechanosensitivity during fluid flow. *American journal of physiology. Cell physiology*. 306(11):C1058-67.
36. Scheiblin DA, Gao J, Caplan JL, Simirskii VN, **Czymmek KJ**, Mathias RT, Duncan MK. 2014. Beta-1 integrin is important for the structural maintenance and homeostasis of differentiating fiber cells. *The international journal of biochemistry & cell biology*. 50:132-45.
37. Jansson KH, Castillo DG, Morris JW, Boggs ME, **Czymmek KJ**, Adams EL, Schramm LP, Sikes RA. 2014. Identification of beta-2 as a key cell adhesion molecule in PCa cell neurotropic behavior: a novel ex vivo and biophysical approach. *PloS one*. 9(6):e98408.
38. Krishnan V, Xu X, Barwe SP, Yang X, **Czymmek K**, Waldman SA, Mason RW, Jia X, Rajasekaran AK. 2013. Dexamethasone-loaded block copolymer nanoparticles induce leukemia cell death and enhance therapeutic efficacy: a novel application in pediatric nanomedicine. *Molecular pharmaceutics*. 10(6):2199-210.
39. Agrawal B, **Czymmek KJ**, Sparks DL, Bais HP. 2013. Transient Influx of nickel in root mitochondria modulates organic acid and reactive oxygen species production in nickel hyperaccumulator *Alyssum murale*. *The Journal of biological chemistry*. 288(10):7351-62.
40. Padmanabhan MS, Ma S, Burch-Smith TM, **Czymmek K**, Huijser P, Dinesh-Kumar SP. 2013. Novel positive regulatory role for the SPL6 transcription factor in the N TIR-NB-LRR receptor-mediated plant innate immunity. *PLoS pathogens*. 9(3):e1003235.
41. Opitz AW, **Czymmek KJ**, Wickstrom E, Wagner NJ. 2013. Uptake, efflux, and mass transfer coefficient of fluorescent PAMAM dendrimers into pancreatic cancer cells. *Biochimica et biophysica acta*. 1828(2):294-301.
42. Cao T, Jovic V, Modla S, Powell D, **Czymmek K**, Niethammer M. 2013. Robust multimodal dictionary learning. *Medical image computing and computer-assisted intervention: MICCAI International Conference on Medical Image Computing and Computer-Assisted Intervention*.

- 16(Pt 1):259-66.
43. Mathioni SM, Patel N, Riddick B, Sweigard JA, **Czymmek KJ**, Caplan JL, Kunjeti SG, Kunjeti S, Raman V, Hillman BI, Kobayashi DY, Donofrio NM. 2013. Transcriptomics of the rice blast fungus *Magnaporthe oryzae* in response to the bacterial antagonist *Lysobacter enzymogenes* reveals candidate fungal defense response genes. *PloS one*. 8(10):e76487.
 44. Kumar AS, Lakshmanan V, Caplan JL, Powell D, **Czymmek KJ**, Levia DF, Bais HP. Rhizobacteria *Bacillus subtilis* restricts foliar pathogen entry through stomata. 2012. *The Plant journal for cell and molecular biology*. 72(4):694-706.
 45. Kim HS, **Czymmek KJ**, Patel A, Modla S, Nohe A, Duncan R, Gilroy S, Kang S. 2012. Expression of the Cameleon calcium biosensor in fungi reveals distinct Ca(2+) signatures associated with polarized growth, development, and pathogenesis. *Fungal genetics and biology: FG&B*. 49(8):589-601.
 46. Wagner R, Modla S, Hossler F, **Czymmek K**. 2012. Three-dimensional analysis and computer modeling of the capillary endothelial vesicular system with electron tomography. *Microcirculation (New York, N.Y. : 1994)*. 19(6):477-84.
 47. Jansson KH, Lynch JE, Lepori-Bui N, **Czymmek KJ**, Duncan RL, Sikes RA. 2012. Overexpression of the VSSC-associated CAM, β -2, enhances LNCaP cell metastasis associated behavior. *The Prostate*. 72(10):1080-92.
 48. Demir-Hilton E., Hutchins, DA, **Czymmek, K.J.**, Coyne, K., 2012. Description of *Viridilobus marinus* (GEN. ET SP. NOV.), a new raphidophyte from Delaware's Inland Bays. *J Phycol* 48(5): 1220-1231.
 49. Bonor J, Adams EL, Bragdon B, Moseychuk O, **Czymmek KJ**, Nohe A. Initiation of BMP2 signaling in domains on the plasma membrane. 2012. *Journal of cellular physiology*. 227(7):2880-8.
 50. Wei., D., Jacobs, S., Modla, S., Zhang, S., Young, C.L., Cirino, R., Caplan, J. and **Czymmek, K.** 2012. High-resolution three-dimensional reconstruction of a whole yeast cell using focused-ion beam scanning electron microscopy. *Biotechniques*. 53:41-48.
 51. Young, C.L., Raden, D.L., Caplan, J., **Czymmek, K.**, and Robinson, A.S. 2012. Optimized cassettes for live-cell imaging of proteins and high-resolution in yeast. *Yeast*. 29:119-136.
 52. Thévenin, A.F., Monillas, E.S., Winget, J.M., **Czymmek, K.**, and Bahnson, B.J. 2011. Trafficking of platelet-activating factor acetylhydrolase type II in response to oxidative stress. *Biochem*. 50: 8417-8426.
 53. Caplan, J., Niethammer, M., Taylor, R.M., and **Czymmek, K. J.** 2011. The power of correlative microscopy: multi-modal, multi-scale, multi-dimensional. *Cur. Opin. Struct. Biol*. 21:1-8.
 54. Koku, K., Maier, R.S., **Czymmek, K.J.**, Schure, M.R., and Lenhoff, A.M., 2011. Modeling of flow in a polymeric chromatographic monolith. *J. Chromatography A*. 22: 3466-3475.
 55. Thompson, W.R., Majid, A.S., **Czymmek, K.J.**, Ruff, A.L., García, J., Duncan, R.L., Farach-Carson, M.C. 2011. Association of the $\alpha_2\delta_1$ subunit with $Ca_v3.2$ enhances membrane expression and regulates mechanically induced ATP release in MLO-Y4 osteocytes. *J. Bone Miner. Res*. 26: 2125-2139.
 56. Modla, S., and **Czymmek, K.J.**, 2011. Correlative microscopy: A powerful tool for exploring neurological cells and tissues. *Micron*. 42:773-792.
 57. Bowes, B.D., Traylor, S.J., Timmick, S.M., **Czymmek, K.J.**, and Lenhoff, A.M., 2012. Insights into protein sorption and desorption on dextran-modified ion-exchange media. *Chem. Eng. Technol*. 35:91-101.
 58. Huang, K., **Czymmek, K.J.**, Caplan, J.L., Sweigard, J.A. and Donofrio. N.M. 2011. Suppression of plant-generated reactive oxygen species is required for successful infection by the rice blast fungus. *Virulence*. 2:559-562.
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investigation of colloid retention and mobilization in the presence of moving air-water interface. *Vadose Zone J.* **10**:1250-1260.

61. Knapp, E., Flores, R., Scheiblin, D., Modla, S., **Czymmek, K.**, and Yusibov, V. 2012. A cryohistological protocol for preparation of large plant tissue sections for screening intracellular fluorescent protein expression. *Biotechniques* **52**: 31-37.
62. Huang, K., **Czymmek, K.**, Caplan, J.L., Sweigard, J.A., and Donofrio, N.M. 2011. HYR1-mediated detoxification of reactive oxygen species is required for full virulence in the rice blast fungus. *PLoS Pathog.* 2011 Apr;7(4):e1001335. Epub 2011 Apr 14.
63. Adams, E.L., Emerson, D., Croker, S., Kim, H., Kang, S., and **Czymmek, K.** 2011. Atomic Force Microscopy (AFM): A Tool for Studying Biophysical Surface Properties Underpinning Fungal Interactions with Plants and Substrates. In press In: T. Bart and M. Bolton (eds.) *Plant Fungal Pathogens: Methods and Protocols*. Humana Press, Totowa.
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65. Kim, H.-S., Park, S.-Y., Lee, S., Adams, E. L., **Czymmek, K.**, and Kang, S. 2011. Loss of cAMP-dependent protein kinase A affects multiple traits important for root pathogenesis by *Fusarium oxysporum*. *Mol. Plant-Microbe Interact.* **24**: 719-732.
66. Thompson, WR, Modla S, Grindel BJ, **Czymmek KJ**, Kirn-Safran CB, Wang L, Duncan RL, and Farach-Carson MC. 2011. Perlecan/Hspg2 deficiency alters the pericellular space of the lacuno-canalicular system surrounding osteocytic processes in cortical bone. *J. Bone Miner. Res.* **26**: 618-629.
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