

**ELIZABETH VIERLING**  
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**EDUCATION**

- 2007-08 (Summers) Sabbatical Research, Max Planck Institute for Molecular Plant Physiology, Golm, Germany, Sponsor Dr. N. Mark Stitt. (Alexander Von Humboldt support)
- 2000-01 Sabbatical Research, Wageningen Univ., Wageningen, The Netherlands, Sponsor, Dr. M. Koornneef. (NSF and Guggenheim support)
- 1993-94 Sabbatical Research, Whitehead Institute for Biomedical Research, Sponsor, Dr. G. Fink.
- 1982-85 Postdoctoral Research Associate, Botany Department, Univ. of Georgia, Athens, GA, Dr. J.L. Key, advisor.
- 1982 Ph.D., Biology, The University of Chicago, Chicago, IL. Dissertation title: "Structure and Biosynthesis of the P700 Chlorophyll *a* Protein" Dr. R.S. Alberte, advisor.
- 1979 M.S., Biology, The University of Chicago, Chicago, IL.
- 1979 Physiology Course, Marine Biological Laboratory, Woods Hole, MA.
- 1975 B.S., Botany, University of Michigan, Ann Arbor, MI.
- 1973 Junior Year in Freiburg, Albert-Ludwigs Universität, Germany.

**EMPLOYMENT**

- 2022 Distinguished Professor Emerita, University of Massachusetts Amherst. Amherst MA.
- 2013 Distinguished Professor, University of Massachusetts Amherst. Amherst MA.
- 2011 Professor, Department of Biochemistry & Molecular Biology, University of MA, Amherst, MA; Regents' Professor Emerita, University of Arizona, Tucson, AZ
- 2008 - 10 Program Director, BIO/MCB National Science Foundation, Arlington, VA
- 2008 Regents' Professor, Dept. Chemistry & Biochemistry, University of Arizona
- 1999 Joint Professor of Plant Sciences, University of Arizona
- 1996 Professor of Biochemistry & Molecular Biophysics, and of Molecular and Cellular Biology, University of Arizona, Tucson, AZ.
- 1991 Associate Professor of Biochemistry and of Molecular and Cellular Biology, University of Arizona, Tucson, AZ.
- 1986 Joint Faculty, Department of Molecular and Cellular Biology, Univ of AZ, Tucson, AZ.
- 1985 Assistant Professor of Biochemistry, Univ of AZ, Tucson, AZ.

**HONORS AND AWARDS**

- 2023 Member National Academy of Sciences USA
- 2013 University of Massachusetts Spotlight Scholar
- 2012 Appointed Fellow of the American Society of Plant Biologists
- 2012 Distinguished Graduate of Riverdell High School, Oradell, NJ
- 2007 Alexander von Humboldt Senior Research Fellow
- 2002 Elected Fellow of the AAAS
- 2000 John Simon Guggenheim Memorial Fellow
- 1997 NSF/JSPS Short Term Invitation Fellowship for Research in Japan
- 1993-97 American Cancer Society Faculty Research Award.
- 1978-81 Trainee, NIH Cell & Molecular Biology Training Grant, University of Chicago.
- 1979 Junior Researcher, Physiology Course, MBL, Woods Hole, MA; Society of General Physiologists Grant (summer).
- 1976-78 Hutchinson Botany Fellow, University of Chicago.
- 1971-75 National Merit Scholar, University of Michigan.

## PUBLICATIONS (Complete list) (136 total)

**Peer Reviewed:** (111 total published) (\* undergraduate authors)

All: **H-Index – 80**, i10 – 117; **Citations: 27,448** (Apr 2024 – Google Scholar)

Since 2019: H-Index – 44, i10 index 87; Citations: 6870 (Apr 2024 – Google Scholar)

112) Treffon, P., E. Vierling. Organomercury capture of nitrosated proteins and label-free proteomics link protein quality control, argonaute proteins and UDP-glucosyl transferases to fertility defects due to disrupted NO homeostasis. *Front Plant Sci.*, in prep. (2024).

111) Meloni, M., J. Rossi, S. Fanti, G. Carloni, D. Tedesco, P. Treffon, L. Piccininie, G. Falini, P. Trost, E. Vierling, F. Licausi, B. Giuntoli, F. Musiani, S. Fermani, M. Zaffagnini. Structural and biochemical characterization of Arabidopsis alcohol dehydrogenases reveals distinct functional properties but similar redox sensitivity. *The Plant Journal* (2024) <http://doi.org/10.1111/tpj.16651>

110) Wang, J., X. Guo, Y. Chen, T. Liu, J. Zhu, S. Xu, E. Vierling. Maternal nitric oxide homeostasis impacts female gametophyte development under optimal and stress conditions. *Plant Cell*. In press (2024). <https://doi.org/10.1093/plcell/koae043>

109) Waters, E., M. Bezanilla, E. Vierling. ATAD3 Proteins: Unique Mitochondrial Proteins Essential for Life in Diverse Eukaryotes. *Plant & Cell Physiology* (2023). <https://doi.org/10.1093/pcp/pcad122>

108) Zhu, L., A. Scafaro, E. Vierling, M. Ball, B. Posch, F. Stock, O. Atkin. Heat tolerance of a tropical-subtropical rainforest tree species *Polyscias elegans*: time-dependent dynamic responses of physiological thermostability and biochemistry. *New Phytologist* (2023). <https://doi.org/10.1111/nph.19356>

107) Kim, M, J.D. Swenson, F. McLoughlin, E. Vierling. Phenotypes of a mutant in the mRNA 3' maturation factor CstF77 demonstrate mRNA 3' end formation is critical to the heat shock response and emphasize the central role of HSP101 in thermotolerance bioRxiv (2021) <https://doi.org/10.1101/2021.10.31.466691>. *Plant Cell* 35:924-941 (2022).

106) Treffon, P., E. Vierling. Focus on nitric oxide homeostasis: Direct and indirect enzymatic regulation of protein denitrosation reactions in plants. *Antioxidants* 11: 1411 (2022) [doi.org/10.3390/antiox11071411](https://doi.org/10.3390/antiox11071411).

105) Treffon, P., J. Rossi, G. Gabbellini, P. Trost, M. Zaffagnini, E. Vierling. Quantitative proteome profiling of a S-nitrosoglutathione reductase (GSNOR) null mutant reveals a new class of enzymes involved in nitric oxide homeostasis in plants. *Front Plant Science* 12:787435. (2021) doi: 10.3389/fpls.2021.787435.

104) Liu, T., J. Arsneault\*, E. Vierling, M. Kim. Mitochondrial ATP Synthase Subunit d, a Component of the Peripheral Stalk, is Essential for Growth and Heat Stress Tolerance in *Arabidopsis thaliana*. bioRxiv (2021) <https://doi.org/10.1101/2021.02.02.429459>, *Plant Journal* 107:713-726. doi: 10.1111/tpj.15317.

- 103) Kim, M., V. Schulz, L. Brings, T. Schoeller, K. Kühn, E. Vierling. mTERF18 and ATAD3 are required for mitochondrial nucleoid structure and their disruption confers heat tolerance in *Arabidopsis thaliana*. [First published in bioRxiv (2020) 2020.05.11.088575]; New Phytologist 232: 2026-2042 (2021) <https://doi.org/10.1111/nph.17717>. Recommended: Leister D and Kleine T: Faculty Opinions Recommendation of [Kim M et al., New Phytol 2021 232(5):2026-2042]. In Faculty Opinions, 09 Nov 2021; [10.3410/f.740764188.793589415](https://doi.org/10.3410/f.740764188.793589415)
- 102) Wang, J., X. Guo, J. Zhu, Q. Xiao, A. Cheung, R. Palanivelu, L. Yuan, E. Vierling, S. Xu. Auxin efflux controls orderly nucellar degeneration and expansion of the female gametophyte in Arabidopsis. New Phytologist 230:2261-2274 (2021) <https://doi.org/10.1111/nph.17152>
- 101) Waters, E., E. Vierling. Plant Small Heat Shock Proteins - Evolutionary and Functional Diversity. New Phytologist – Tansley Review. 227:24-37 (2020). <https://doi.org/10.1111/nph.16536>
- 100) McLoughlin, F., M. Kim, R. S. Marshall, R. D. Vierstra, and E. Vierling. HSP101 interacts with the proteasome and promotes the clearance of ubiquitylated protein aggregates. Plant Physiol. 180:1829-1847 (2019). DOI:10.1104/pp.19.00263. Highlighted in Plant Physiol. News and Views: 180:1777-1778. DOI: <https://doi.org/10.1104/pp.19.00711>.
- 99) Santhanagopalan, I., M.T. Degiacomi, D.A. Shepard, G.K.A. Hochberg, J.L.P. Benesch, E. Vierling. It takes a dimer to tango: Oligomeric small heat shock proteins dissociate to capture substrate. J. Biol. Chem. 293: 19511–19521 (2018). Cover article.
- 98) Wang, X., L. Hou, Y. Lu, B. Wu, X. Gong, M. Liu, J. Wang, Q. Sun, E. Vierling, S. Xu. Metabolic adaptation of wheat grain contributes to stable filling rate under heat stress. J. Exp. Bot. 69: 5531-5545 (2018). <https://doi.org/10.1093/jxb/ery303>
- 97) Marklund, E. G., Y. Zhang, E. Basha, J. L.P. Benesch, E. Vierling. Structural and functional aspects of the interaction partners of the small heat-shock protein in *Synechocystis*. Cell Stress & Chaperones <https://doi.org/10.1007/s12192-018-0884-3> (2018). PMID: PMC6045555
- 96) Hochberg, G. K.A., D. A. Shepherd, E.G. Marklund, I. Santhanagopalan, M. Degiacomi, A. Laganowsky, T. M. Allison, E. Basha, M. T. Marty, M. R. Galpin, W. B. Struwe, A. J. Baldwin, E. Vierling, J. L.P. Benesch. Structural principles that enable oligomeric small heat-shock protein paralogs to evolve distinct functions. Science 359: 930-935 (2018). PMID:29472485
- 95) Guerra, D., S. Eyles, I. Truebridge, P. Treffon, E. Vierling. Direct detection of in vitro protein nitrosation by mass spectrometry: S-Nitrosoglutathione Reductase as a Model Protein. In: Mengel A., Lindermayr C. (eds) Nitric Oxide. Methods in Molecular Biology, vol 1747, pp 143-160. Humana Press, New York, NY (2018). PMID:29600457
- 94) Zhang, L. X. Liu, K. Gaikwad, X. Kou, F. Wang, X. Tian, M. Xin, Z. Ni, Q. Sun, H. Peng, E. Vierling. Mutations in eIF5B confer thermosensitive and pleiotropic phenotypes via translation defects in *Arabidopsis thaliana*. Plant Cell 29:1952-1969 (2017). PMID: 28808135
- 93) Kim, M., F. McLoughlin, E. Basha, E. Vierling. Assessing tolerance to acute heat stress. Bio-protocol 7(14): e2405. DOI: 10.21769/BioProtoc.2405 (2017).

- 92) McLoughlin, F., E. Basha, M. E. Fowler\*, M. Kim, J. Bordowitz\*, S. Katiyar-Agarwal, E. Vierling. Class I and II small heat shock proteins together with HSP101 protect eukaryotic protein translation factors during heat stress. *Plant Physiol.* 172:1221-1236 (2016). PMID:27474115
- 91) Guerra, D., K. Ballard, I. Truebridge\*, E. Vierling. S-nitrosation of conserved cysteines modulates activity and stability of S-nitrosogluthione reductase (GSNOR). *Biochemistry* 55:2452-64 (2016). PMID:27064847
- 90) Haslbeck, M., E. Vierling. A first line of defense: Small heat shock proteins and their function in protein homeostasis. *J. Mol. Biol.* 427:1537-48 (2015). PMID:25681016
- 89) Patel, S., E. Vierling, F. Tama. Replica exchange molecular dynamics simulations provide insight into substrate recognition by small heat shock proteins. *Biophys. J.* 106:2644-2655 (2014). PMID:24940782
- 88) Xu, S., D. Guerra, U. Lee, E. Vierling. S-Nitrosogluthione reductases are low-copy number, cysteine-rich proteins in plants that control multiple developmental and defense responses in Arabidopsis. *Front. Plant Sci.* 4: 1-13 (2013). doi: 10.3389/fpls.2013.00430. PMID:24204370
- 87) Basha, E. C. Jones, A.E. Blackwell, G. Cheng, E.R. Waters, K.A. Samsel\*, M. Siddique, V. Pett, V. Wysocki, E. Vierling. An unusual dimeric small heat shock protein provides insight into the mechanism of this class of chaperones. *J. Mol. Biol.* 425:1683-96 (2013). PMID: 23416558
- 86) Kim, M., U. Lee, I. Small, C. des Francs-Small, E. Vierling. Mutations in a mitochondrial transcription termination factor (mTERF)-related protein enhance thermotolerance in the absence of the major molecular chaperone HSP101. *Plant Cell* 24:3349-65 (2012). PMID: 22942382
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- 84) Basha, E., H. O'Neill, E. Vierling. Small Heat Shock Proteins/ $\alpha$ -crystallins: Dynamic proteins with flexible functions. *Trends Biochem. Sci.* 37:106-117 (2012). PMID:22177323
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- 82) Basha, E., C. Jones, V. Wysocki, E. Vierling. Mechanistic differences between two conserved classes of small heat shock proteins found in the plant cytosol. *J. Biol. Chem.* 285:11489-11497 (2010). PMID: 20145254
- 81) Stengel, F., A. J. Baldwin, A. J. Painter, N. Jaya, E. Basha, L. E. Kay, E. Vierling, C. V. Robinson, J. L.P. Benesch. Quaternary dynamics and plasticity underlie small heat shock protein chaperone function. *Proc. Natl. Acad. Sci.* 107:2007-2012 (2010). Featured in PNAS commentary: 107:2727-2728. PMID: 20133845

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- 79) Cheng, G., E. Basha, V.H. Wysocki, E. Vierling. Insights into small heat shock protein and substrate structure during chaperone action derived from hydrogen/deuterium exchange and mass spectrometry. *J. Biol. Chem.* 283:26634-42 (2008). Featured as "Paper of the Week". PMID: 18621732
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- 75) Offerdahl, E., T. Baldwin, L. Elfring, E. Vierling, M. Ziegler. Reading questions in large lecture courses. *J. College Teaching*, March/April:34-38 (2008).
- 74) Tonsor, S.J., C. Scott, I. Boumanza\*, T.R. Liss, J.L. Brodsky, E. Vierling. Heat shock protein 101 effects in *Arabidopsis thaliana*: Genetic variation, fitness and pleiotropy in controlled environments. *Mol. Ecol.* 17:1614-1626 (2008). PMID:18321256
- 73) Larkindale, J., E. Vierling. Core genome responses involved in acclimation to high temperature. *Plant Physiol.* 146:748-761 (2008). PMID: 18055584
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- 67) Lee, U., I. Rioflorido, S-W. Hong, J. Larkindale, E. R. Waters, E. Vierling. The Arabidopsis ClpB/Hsp100 family of proteins: Chaperones for stress and chloroplast development. *Plant Journal* 49:115-127 (2007). PMID:17144892
- 66) Basha, E., K.L. Friedrich, E. Vierling. The N-terminal arm of small heat shock proteins is important for both chaperone activity and substrate specificity. *J. Biol. Chem.* 281: 39943-39952 (2006). PMID:17090542
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- 52) Liu, Z., S-W. Hong, M. Escobar\*, E. Vierling, D. L. Mitchell, D. W. Mount, J. D. Hall. Arabidopsis UVH6, a homolog of human XPD and yeast RAD3 DNA repair genes, functions in DNA repair and is essential for plant growth. *Plant Physiol.* 132:757-767 (2003). PMID:12857822
- 51) Hong, S-W., U. Lee, E. Vierling. Arabidopsis *hot* mutants define multiple functions required for acclimation to high temperature. *Plant Physiol.* 132:1405-1414 (2003). PMID: 12805605
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- 28) Waters, E.R., G.J. Lee, E. Vierling. Evolution, structure and function of the small heat shock proteins in plants. *J. Exper. Bot.* 47:325-338 (1996). <https://doi.org/10.1093/jxb/47.3.325>
- 27) Osteryoung, K.W., E. Vierling. Conserved cell and organelle division mechanisms. *Nature* 376:473-474 (1995). PMID:7637778
- 26) Viitanen, P.V., M. Schmidt, J. Buchner, T. Suzuki, E. Vierling, R. Dickson, G.H. Lorimer, A. Gatenby, J. Soll. Functional characterization of the higher plant chloroplast chaperonins. *J. Biol. Chem.* 270:10432-10438 (1995). PMID:7629128
- 25) Lee, G.J., N. Pokala, E. Vierling. Structure and in vitro molecular chaperone activity of cytosolic small heat shock proteins from pea. *J. Biol. Chem.* 270:10432-10438 (1995). PMID:7737977
- 24) DeRocher, A., E. Vierling. Cytoplasmic HSP70 homologues of pea: differential expression in vegetative and embryonic organs. *Plant Mol. Biol.* 27:441-456 (1995). PMID:7894010
- 23) Helm, K.W., J. Schmeits\*, E. Vierling. An ER-localized small heat shock protein from Arabidopsis. *Plant Physiol.* 107:287-288 (1995). PMID: 7870826
- 22) Schirmer, E.C., S. Lindquist, E. Vierling. An Arabidopsis heat shock protein complements a thermotolerance defect in yeast. *Plant Cell* 6:1899-1909 (1994). PMID:7866032
- 21) Osteryoung, K.W., E. Vierling. Dynamics of small heat shock protein distribution within the chloroplast of higher plants. *J. Biol. Chem.* 269:28676-28682 (1994). [www.jbc.org/content/269/46/28676.full.pdf](http://www.jbc.org/content/269/46/28676.full.pdf)
- 20) Chen, Q., K.W. Osteryoung, E. Vierling. A 21 kDa chloroplast heat shock protein assembles into high molecular weight complexes *in vivo* and *in organelle*. *J. Biol. Chem.* 269:13216-13223 (1994). <http://www.jbc.org/content/269/18/13216>
- 19) DeRocher, A.E., E. Vierling. Developmental control of small heat shock protein expression during pea seed maturation. *Plant J.* 5:93-102 (1994). <https://doi.org/10.1046/j.1365-313X.1994.5010093.x>
- 18) Osteryoung, K.W., H. Sundberg\*, E. Vierling. Poly(A) tail length of a heat shock protein RNA is increased by severe heat stress, but intron splicing is unaffected. *Mol. Gen. Genet.* 239:323-333 (1993). PMID:8391109
- 17) Hernandez, L.D. \*, E. Vierling. Expression of low molecular weight heat shock proteins under field conditions. *Plant Physiol.* 101:1209-1216 (1993). PMID: 12231775

- 16) Helm, K.W., P. Lafayette, R.T. Nagao, J.L. Key, E. Vierling. Localization of small HSPs to the higher plant endomembrane system. *Mol. Cell. Biol.* 13:238-247 (1993). PMID:8417329
  - 15) DeRocher, A., K.W. Helm, L.M. Lauzon, E. Vierling. Expression of a conserved family of cytoplasmic low molecular weight heat shock proteins during heat stress and recovery. *Plant Physiol.* 96:1038-1047 (1991). PMID: 16668295
  - 14) Chen, Q., E. Vierling. Analysis of conserved domains identifies a unique structural feature of a chloroplast heat shock protein. *Mol. Gen. Genet.* 226:425-431 (1991). PMID:2038305
  - 13) Nieto-Sotolo, J., E. Vierling, T-H. D. Ho. Cloning, sequence analysis and expression of a cDNA encoding a plastid-localized heat shock protein in maize. *Plant Physiol.* 93:1321-1328 (1990). PMID: 16667620
  - 12) Chen, Q., L.M. Lauzon, A.E. DeRocher, E. Vierling. Accumulation, stability and localization of a major chloroplast heat shock protein. *J. Cell Biol.* 110:1873-1883 (1990). PMID:2351688
  - 11) Lauzon, L., K. Helm, E. Vierling. A cDNA clone from *Pisum sativum* encoding a low molecular weight heat shock protein. *Nuc. Acids Res.* 18:4274 (1990). PMID: 2377479
  - 10) Marshall, J., A.E. DeRocher, K. Keegstra, E. Vierling. Identification of HSP70 homologues in chloroplasts. *Proc. Natl Acad. Sci.* 87:374-378 (1990). PMID:2296591
  - 9) Helm, K., E. Vierling. An *Arabidopsis thaliana* cDNA clone encoding a low molecular weight heat shock protein. *Nuc. Acids Res.* 17:7995 (1989). PMID:2798141
  - 8) Vierling, E., L. M. Harris, Q. Chen. The major low molecular weight heat shock protein in chloroplasts shows antigenic conservation among diverse higher plant species. *Mol. Cell. Biol.* 9:461-468 (1989). PMID: 2710111
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- 5) Vierling, E., J.L. Key. Ribulose 1,5-bisphosphate carboxylase synthesis during heat shock. *Plant Physiol.* 78:155-162 (1985). PMID: 16664190
  - 4) Vierling, E., R.S. Alberte. P700 chlorophyll *a*-protein: purification, characterization, and antibody production. *Plant Physiol.* 72:625-633 (1983). PMID: 16663057
  - 3) Vaughn, K.C., E. Vierling, S.O. Duke, R.S. Alberte. Immunocytochemical and cytochemical localization of photosystems I and II. *Plant Physiol.* 73:203-207 (1983). PMID: 16663195
  - 2) Vierling, E., R.S. Alberte. Regulation of synthesis of the photosystem I reaction center. *J. Cell Biol.* 97:1806-1814 (1983). DOI: 10.1083/jcb.97.6.1806
  - 1) Vierling, E., R.S. Alberte. Functional organization and plasticity of the photosynthetic unit of the cyanobacterium *Anacystis nidulans*. *Physiologia Plant.* 50:93-98 (1980). <https://doi.org/10.1111/j.1399-3054.1980.tb04432.x>

**Other Invited reviews: (12 total)**

- 12) Vierling, E. Mechanism of chaperone action of small heat shock proteins, in ed. W. Houry, *Molecular Chaperones: Principles and Diseases* (Henry Stewart Talks, London, 2007). Online at: <http://www.hstalks.com/molchap/index.htm>
- 11) Kotak, S., J. Larkindale, U. Lee, P. von Koskull-Döring, E. Vierling, K-D. Scharf. Complexity of the heat stress response in plants. *Curr. Opin. Plant Biol.* 10:310-316 (2007). PMID:17482504
- 10) Scharf, K-D., M. Siddique, E. Vierling. The expanding family of *Arabidopsis thaliana* small heat stress proteins (sHsps) and a new family of proteins containing  $\alpha$ -crystallin domains (Acid proteins). *Cell Stress & Chaperones* 6:225-237 (2001). PMID: 11599564
- 9) Lee, G.J., E. Vierling. Expression, purification and molecular chaperone activity of recombinant plant small heat shock proteins. In: *Protein Folding: Catalysts, accessory proteins, and chaperones*. G. Lorimer and T.O. Baldwin, eds. *Methods in Enzymology* 290:350-365 (1998). PMID:7737977
- 8) E. Vierling. The small heat shock proteins in plants are members of an ancient family of heat induced proteins. *Acta Physiologiae Plantarum* 19:539-547 (1997). <https://doi.org/10.1007/s11738-997-0051-4>
- 7) Gaestel, M., E. Vierling, J. Buchner. The small heat shock proteins - an overview. In: *Handbook of molecular chaperones and protein folding catalysts*. M.J. Gething, ed. Sambrook and Tooze Publications at Oxford University Press. pp.269-272 (1997).
- 6) Vierling, E. Plant HSP100/ClpB. In: *Handbook of molecular chaperones and protein folding catalysts*. M.J. Gething, ed. Sambrook and Tooze Publications at Oxford University Press. pp.253-255 (1997).
- 5) Vierling, E. Chloroplast-localized Clp proteins. In: *Handbook of molecular chaperones and protein folding catalysts*. M.J. Gething, ed. Sambrook and Tooze Publications at Oxford University Press. pp.255- 258 (1997).
- 4) Vierling, E., G.J. Lee. Plant small heat shock proteins. In: *Handbook of molecular chaperones and protein folding catalysts*. M.J. Gething, ed. Sambrook and Tooze Publications at Oxford University Press. pp.277-280 (1997).
- 3) Boston, R.S., P.V. Viitanen, E. Vierling. Molecular chaperones and protein folding in plants. In: *Post-transcriptional control of gene expression in plants*. W. Filipowicz and T. Hohn, eds. *Plant Mol. Biology* 32:191-222 (1996). PMID:8980480
- 2) Vierling, E., J.A. Kimpel. Plant responses to environmental stress. *Curr. Opin. Biotechnology* 3:164-179 (1992). DOI: 10.1016/0960-9822(92)90905-P
- 1) Vierling, E. The roles of heat shock proteins in plants. *Ann. Rev. Plant Physiol. Plant Mol. Biol.* 42:579-620 (1991). <https://doi.org/10.1146/annurev.pp.42.060191.003051>

**Book Chapters: (7 total)**

- 7) Santhanagopalan, I., E. Basha, K. N. Ballard, N. E. Bopp, E. Vierling. Model Chaperones: Small Heat Shock Proteins from Plants. in: *The Big Book of Small Heat Shock Proteins*, Ed. R.M. Tanguay and L. Hightower, Stuart Calderwood Series, Springer Verlag, pp 119-153 (2015).
- 6) Larkindale, J., M. Mishkind, E. Vierling. Plant responses to high temperature: In: *Plant Abiotic Stress*. Matthew A. Jenks and P.M. Hasegawa, eds. Blackwell Publishing (2005).
- 5) van Montfort, R., C. Slingsby, E. Vierling. Structure and function of the small heat shock protein/ $\alpha$ -crystallin family of molecular chaperones. In: *Protein Folding in the Cell*. Advances in Protein Chemistry Series. A. Horwich, ed. Academic Press. Vol 59:105-156 (2002).
- 4) Vierling, E. Heat shock protein function and expression in plants. In: *Stress Responses in Plants: Adaptation Mechanisms*. Ruth Alscher, ed. Alan R. Liss, Inc. N.Y. pp.357-375 (1990).
- 3) Nagao, R.T., J.A. Kimpel, E. Vierling, J.L. Key. The heat shock response: A comparative analysis. In: *Oxford Surveys of Plant Molecular and Cell Biology*. B. Mifflin, ed. Oxford Univ. Press, pp. 384-438 (1986).
- 2) Key, J.L., J. Kimpel, E. Vierling, C.-Y. Lin, R.T. Nagao, E. Czarnecka, F. Schöffl. Physiological and molecular aspects of the heat shock response in plants. In: *Changes in Gene Expression in Response to Environmental Stress*. B. Atkinson & D. Walden, eds. Academic Press (1985).
- 1) Key, J.L., J.A. Kimpel, C.Y. Lin, R.T. Nagao, E. Vierling, et al. The heat shock response in soybean. In: *Cellular and Molecular Biology of Plant Stress*. J.L. Key & T. Kosuge, eds. Alan R. Liss, N.Y. (1985).

**Symposium Articles - invited: (7 total)**

- 7) Carra, S., S. Alberti, P.A. Arrigo, J. L. Benesch, I. J. Benjamin, W. Boelens, B. Bartelt-Kirbach, B. J. J. M. Brundel, J. Buchner, B. Bukau, J. A. Carver, H. Ecroyd, C. Emanuelsson, S. Finet, N. Golenhofen, P. Goloubinoff, N. Gusev, M. Haslbeck, L. E. Hightower, H. H. Kampinga, R. E. Klevit, K. Liberek, H. S. Mchaourab, K. A. McMenimen, A. Poletti, R. Quinlan, S. V. Strelkov, M. E. Toth, E. Vierling, R. M. Tanguay. The growing world of small heat shock proteins: from structure to functions. *Cell Stress Chaperones*. DOI 10.1007/s12192-017-0787-8 March (2017).
- 6) Waters, E.R., E. Vierling. Molecular adaptation: A phylogenetic approach to the evolution of the small heat shock proteins in plants. Proceedings of the US-Japan Binational Workshop in Molecular Evolution. The Graduate University for Advanced Studies, Hayama, Japan. (1995).
- 5) Osteryoung, K.W., B. Pipes, N. Wehmeyer, E. Vierling. Studies of a chloroplast-localized small heat shock protein in *Arabidopsis*. In: *Biochemical and Cellular Mechanisms of Stress Tolerance in Plants*. J. Cherry, ed. NATO ASI Series. Vol H 86: 97-113. Springer-Verlag, Berlin (1994).  
<https://www.springer.com/us/book/9783642791352>
- 4) Osteryoung, K., E. Vierling. Genetic approaches to the function of the chloroplast low molecular weight heat shock proteins. In: *Research in Photosynthesis*, Norio Murata, ed. Vol IV, pp.129-136. Kluwer Academic Publishers, Dordrecht, The Netherlands (1992).

3) Vierling, E., A. Sun. Developmental regulation of heat shock proteins in higher plants. NATO ASI Series. *Environmental Stress in Plants*. J. Cherry, ed. Vol. G19: 343-354. Springer-Verlag, Berlin. (1989). <https://link.springer.com/book/10.1007%2F978-3-642-73163-1>

2) Vierling, E. Characterization of chloroplast-localized heat shock proteins. In: *Plant Gene Systems and their Biology*, L. McIntosh, J.L. Key, eds. A.R. Liss, Inc., pp. 99-108 (1987).

1) Vierling, E., J.K. Roberts, R.T. Nagao, J.L. Key. A chloroplast heat shock protein has homology to cytoplasmic heat shock proteins. In: *Progress in Photosynthesis Research*. J. Biggins, ed. Vol IV: 143-145 (1987). [https://doi.org/10.1007/978-94-017-0519-6\\_31](https://doi.org/10.1007/978-94-017-0519-6_31)

## **SCHOLARLY PRESENTATIONS**

### **Invited Seminars:**

Zoecon Corporation, Palo Alto, CA - February 1986  
University of California, Davis, CA - May 1987  
Arizona State University, Tempe, AZ - October 1987  
Washington University, St. Louis, MO - January 1989  
Michigan State University, East Lansing, MI - October 1989  
University of Florida, Gainesville, FL - October 1989  
University of Arizona, Tucson, AZ - November 1989  
Akademie der Wissenschaften der DDR, Halle, East Germany - June 1990  
Universität Tübingen, Tübingen, West Germany - June 1990  
University of Missouri, Columbia, MO - November 1990  
University of California, Berkeley, CA - November 1990  
University of California, Los Angeles, CA - May 1991  
University of Illinois, Champaign, IL - September 1991  
Columbia College of Physicians and Surgeons, NY, NY - November 1991  
Carnegie Institute of Plant Biology, Stanford, CA - January 1992  
DuPont de Nemours & Co., Wilmington, DE - June 1993  
New Mexico State University, Las Cruces, NM - October 1994  
University of California, Davis, CA - September 1995  
University of Illinois, Champaign, IL - December 1995  
University of Arizona, Cancer Center - September 1996  
University of California, Riverside, CA - January 1997  
Colorado State University, Fort Collins, CO - May 1997  
National Taiwan University, Taipei, Taiwan - October 1997  
Academia Sinica, Taipei, Taiwan - October 1997  
Ehime University, Matsuyama, Japan - March 1998  
Kyoto University, Kyoto Japan - March 1998  
Saitama University, Urawa, Japan - March 1998  
Albert-Ludwigs Universität, Freiburg, Germany - December 1998  
University of Frankfurt, Frankfurt, Germany - December 1998  
University of Nebraska, Biotechnology Center, Lincoln, NE - August 1999  
University of South Dakota, Vermillion, SD - November 1999  
University of Nijmegen, Nijmegen, The Netherlands - September 2000  
Wageningen University, Wageningen, The Netherlands - October 2000  
Goethe Universität, Frankfurt, Germany - November 2000  
Max Planck Institute, Cologne, Germany - December 2000

Birkbeck College, University of London - February 2001  
University of Utrecht, Utrecht, The Netherlands - March 2001  
Kiel University, Kiel, Germany - May 2001  
Institute of Biology, Seville, Spain - June 2001  
Michigan State University - October 2001  
University of British Columbia - September 2002  
University of Missouri, Columbia; Department of Biochemistry - December 2003  
Cornell University, Ithaca, NY - November 2004  
University of Arizona, EEB Department - February 2005  
Rice University, Houston, TX, Department of Biology –February 2005  
University of Texas, Austin, TX, Department of Biochemistry - February 2005  
Peking University – October 2005  
China Agricultural University – October 2005  
Oberlin College - March 2006  
Wooster College of Ohio - March 2006  
University of Ohio, Wooster - March 2006  
CERES, Inc., Westlake CA – August 2006  
University of Arizona, AHCC “Frontiers in Biomedical Research – October 2006  
University of Arizona, Cancer Biology Program – March, 2007  
University of Arizona, Dept. Cell Biology & Anatomy – April 2007  
Purdue University – May 2007  
Monsanto Company, St. Louis, MO – June 2007  
Max Planck Institute for Molecular Plant Physiology, Potsdam, Germany – August, 2007  
Max Planck Institute for Plant Breeding Research, Köln, Germany – June 2008  
University of Heidelberg, Heidelberg, Germany – June 2008  
University of Massachusetts, Amherst – March 2010  
Olomouc University, Olomouc, Czech Republic – November 2011  
University of Toronto, Scarborough Campus, Canada – March 2012  
University of Toronto, Toronto, Canada – March 2012  
University of Pennsylvania, Philadelphia, PA - Host: Walter Englander – March 2013  
University of Massachusetts, Stockbridge School of Ag – Host: Om Parkash – Feb 2014  
University of Florida, Gainesville, FL – March 2014  
University of Maryland, College Park, MD – Host Jianhua Zhu – May 2014  
China Agricultural University, Beijing, China – Host Huiru Peng – Sept 2014  
Northwest University of Agriculture and Forestry, Yangling, China – Host Shengbao Xu – Sept 2014  
Instituto de Biotecnología, UNAM, Cuernavaca, Mexico – Host Alejandra Covarrubias – Oct 2015  
Rhode Island College, RI. “Transgenic Plants: From Basic Research to Agricultural Applications” – Oct 2016  
Northwest University of Agriculture and Forestry, Yangling, China – Nov 2017  
Lanzhou University, Lanzhou, China – Nov. 2017  
China Agricultural University, Beijing, China – Nov 2017  
Tianjin University, Tianjin, China – Nov 2017  
Shanghai Center for Plant Stress Biology, Chinese Academy of Sciences. “Controlling protein folding and reactive oxygen species: Keys to plant stress tolerance” – Nov 2017  
University of Wollongong, Wollongong Australia. “Capturing denaturing substrates with small HSPs” March 2018  
University of Western Australia, Perth Australia. “The mTERF18/SHOT1 protein modulates mitochondrial function to confer increased plant heat tolerance”. Apr 2018

Australian National University, Canberra Australia. "What am I doing here, and What's up with all these small HSPs anyway?" Apr 2018.

Australian National University, Canberra Australia. "Controlling protein folding and reactive oxygen species: Keys to plant stress tolerance" Apr 2018.

Technische Universität München, Garching, Germany. "A Diversity of sHSP Chaperones". July 2019.

University of Arizona, Tucson, AZ. "Making Connections: Mitochondria & Stress Tolerance". Feb 2020.

ASPB Plantae Presents webinar. "From Chaperones to Mitochondria: Surviving Stress". Oct 2020.

### **Invited Symposium/Conference Presentations:**

UCLA Symposium: Plant Gene Systems and their Biology, Tamarron, CO - February 1987

NATO Advanced Study Workshop: Biochemical and Physiological Mechanisms Associated with Environmental Stress Tolerance in Plants, Norwich, England - August 1987

Conference on Molecular Mechanisms of Plant Stress: Hannover, West Germany - February 1988

Gordon Conference: Plant Response to Temperature Stress. Oxnard, CA - January 1989

Gordon Conference: Plant Molecular Biology. Speaker and Session Chair, NH - June 1989

UCLA Symposium: Molecular Strategies for Crop Improvement, Keystone, CO "Hot Topics" short presentation (given by Dr. K. Helm, representing the lab) - April 1990

American Society for Horticultural Science: Tucson, AZ - November 1990

AAAS Regional meeting (Southwest/Rocky Mountain Division): Lubbock, TX - May 1991

US-Taiwan Workshop in Plant Molecular Biology: St. Louis, MO - June 1991

NSF Workshop: Plant Stress Biology, Tuskegee University, Tuskegee AL - September 1991

IXth International Congress on Photosynthesis: Nagoya, Japan - August 1992

Biotechnology for Crop Improvement: Caracas, Venezuela - November 1992

Gordon Conference: Plant Response to Temperature Stress. Oxnard, CA - February 1993

Mid-Atlantic Plant Molecular Biology Symposium: Univ. of Maryland, College Park, MD - July 1994

ASCB Annual Cell Biology Meetings: Minisymposium on Molecular Chaperones. San Francisco, CA - December 1994

Keystone Symposium: Plant Cell Biology, Speaker and Workshop Chair - January 1995

Gordon Conference: Plant Response to Temperature Stress. Session Chair. Oxnard, CA - February 1995

Society for Experimental Biology: Annual meeting in St. Andrew's, Scotland. Symposium Speaker - April 1995

Cold Spring Harbor: Molecular Chaperones and Protein Folding - May 1996

American Society of Plant Physiologists: National meeting, San Antonio, TX. Symposium talk and session chair - July 1996

Advances in the Molecular Biology of Photosynthesis. NSF sponsored US-Japan Workshop. Grand Canyon, AZ - November 1996

International Conference on Molecular Biology of Plants under Environmental Stress. Symposium speaker. Poznan, Poland - September 1997

International Society for Plant Molecular Biology: International Congress, Singapore. Symposium speaker - September 1997

Cold Spring Harbor: Molecular Chaperones and Protein Folding. Session chair and invited speaker. Talk given by Dr. Gary Lee from my lab - May 1998

Gordon Conference: Plant Response to Temperature Stress. Session Chair and Speaker. Oxnard, CA - February 1999

SFB Symposium, Tübingen, Germany: Mechanisms of Cell Behavior - October 1999

Cold Spring Harbor: Molecular Chaperones and Protein Folding. Invited short talk. May 2000.

International Symposium of the Leopoldina Academy: Progress in Plant Sciences, Halle, Germany - November 2000

Molecular Chaperones: Meeting of Dutch Researchers, Nijmegen, The Netherlands - January 2001

Dutch Society of Plant Physiologists: Lunteren, The Netherlands - March 2001

First International Congress of Seed Stress Biology: Wageningen, The Netherlands - April 2001

EU Conference "Molecular Chaperones". St. Feliu, Spain - May 2001

Conference on Medical Importance of Stress Proteins. Grenoble, France - June 2001

Annual Meeting of FEBs. Lisbon, Portugal - July 2001

Cold Spring Harbor: Molecular Chaperones and Protein Folding. Invited short talk. May 2002

FASEB Protein Folding Meeting. Vermont - August 2002

Gordon Conference: Plant Response to Temperature - Oxnard, CA; January 2003. Organizing Committee & Session Chair.

Indo-US Agricultural Biotechnology Conference: New Delhi, India, May 2003.

American Society for Research in Vision and Ophthalmology (ARVO). Speaker, Ft. Lauderdale, FL., May 2003.

14<sup>th</sup> International Arabidopsis Conference: June 2003; Speaker and session chair.

XII<sup>th</sup> International Congress on Genes, Gene Families and Isozymes: Berlin, Germany, July 2003.

Annual Meeting of American Society for Plant Biology: Symposium speaker, Honolulu, HI, Aug. 2003.

Keystone Conference: Plant Responses to Abiotic Stress. February 2004 Co- Organizer, Speaker and Session Chair.

Third International Conference on Biological Sciences - Tanta, Egypt, April 2004.

FASEB Conference: Protein Folding in the Cell. Vermont - August 2004.

III<sup>ce</sup> Cycle Romand Meeting: Protein Folding in Cell Biology and Disease, Villars, Switzerland - Sept 2004

14<sup>th</sup> Queenstown Molecular Biology Meeting: Queenstown, NZ, Nov. 2004.

Gordon Conference: Plant Response to Temperature - January 2005, Keynote Speaker and Vice Chair.

5<sup>th</sup> Symposium on Post-Transcriptional Mechanisms in Plant Gene Regulation: Austin TX. Invited Speaker, June 2005.

Plant Stress Symposium: Chonnam National University, Kwanju, Korea. One of five invited speakers. Sept 2005.

NAS Sackler Symposium: Washington, D.C. April 2006

Third Trinational Arabidopsis Conference: Tuebingen, Germany Sept. 2006.

First Shennong Center Symposium with Huazhong Agricultural University: Wuhan China, May 2007.

Gordon Conference: Stress Proteins in Growth, Development and Disease, August, 2007 Oxford, UK

3rd Cell Stress Society International Congress: Stress Responses in Biology and Medicine, August, 2007 Budapest, Hungary. Plenary Speaker.

Umea Plant Science Center, Umea, Sweden. Plant Abiotic Stress Symposium. August 2007.

POG: Plant Oxygen Group meeting: Ghent, Belgium. Invited talk from abstract. September, 2007

Richard and Elizabeth Hageman Distinguished Lecturer in Agricultural Biochemistry – Kansas State University – October 2007 <http://www.k-state.edu/bchem/Hageman.htm>

International Symposium: Biotechnology for Better Crops, Energy and Health – Taipei, Taiwan, May 2008

Adaptation Potential in Plants: Gregor Mendel Institute, Vienna Austria, March 2009.

Gordon Conference: Stress Proteins in Growth, Development and Disease, Andover, NH. July, 2009.

Keystone Conference: Plant Abiotic Stress Tolerance Mechanisms, Water and Global Agriculture, CO, Jan 2011.

Third EMBO Conference on "The Biology of Molecular Chaperones", Austria. May 2011.



5<sup>th</sup> International Congress on Stress Responses in Biology and Medicine: Quebec City, Canada. August, 2011

Perspectives on Modern Plant Physiology Symposium: Frankfurt Germany, August 2011.

Royal Society International Seminar Series: Combining approaches to conquer  $\alpha$ B-crystallin: a paradigm for the structural biology of heterogeneous and dynamic protein assemblies. Oxford, UK, October 2011.

10<sup>th</sup> Anniversary Symposium of The Gregor Mendel Plant Research Institute (GMI): Vienna, Austria, November 2011.

Tropical Vegetation and Rising Temperatures: Functional basis of ecological response. Invited Symposium presentation. Smithsonian Tropical Research Institute. Panama City, Republic of Panama. May 2012.

Molecular Chaperones and Stress Responses: Cold Spring Harbor, NY, Invited short talk. May 2012.

International Symposium of the SFB594 -Molecular machines in proteins folding and translocation: Munich, Germany, July 2012. Unable to attend due to health reasons.

10<sup>th</sup> International Congress on Plant Molecular Biology: Jeju, South Korea, Oct 2012

SPOT-IN: EU Framework Program on Pollen thermotolerance and crop fertility. Keynote Lecture: Frankfurt, Germany, January 2013

2013 International Symposium on Agricultural Biotechnology: Emerging topics in Plant Stress Biology. Academia Sinica, Taipei, Taiwan. May 2013.

EMBO Conference: The Biology of Molecular Chaperones. Pula, Sardinia, Italy. May 2013.

Plant Biology 2013. Minisymposium Chair and Speaker. Providence RI, July 2013.

Plant Biology 2013. Women in Plant Biology, featured luncheon speaker. Providence R.I. July 2013.

ARC Center of Excellence Plant Energy Biology Retreat. Partner investigator lecture. Canberra Australia, Sept 2014.

Cell Stress & Chaperones International: The Small Heat Shock Protein World. Quebec City, Canada, Oct 2014

SPOT-IN: EU Framework Program on Pollen Thermotolerance and Crop Fertility. Sorrento, Italy, March 2015

Interdisciplinary Plant Group's (IPG) 32<sup>nd</sup> Annual Symposium. University of Missouri, Columbia, MO, May 2015

Plant Center 30<sup>th</sup> Anniversary: Joe L Key Symposium. "The Heat Shock Response – 30+ years later!" Athens, GA. May 2016.

6<sup>th</sup> Plant Nitric Oxide International Meeting. Selected from abstracts: "S-Nitrosoglutathione reductase: Role in plant fertility and regulation by NO". Granada, Spain. Sept 2016.

The small HSP World: Second International Workshop of Cell Stress Society International (CSSI). "sHSP Interactions with Substrates" – Bertinoro, Italy. Oct 2016.

13<sup>th</sup> International Conference on Reactive Oxygen and Nitrogen Species in Plants. "S-Nitrosoglutathione Reductase Regulation & Role in Fertilization". Kusadasi, Turkey. Sept 2017.

5<sup>th</sup> International Conference Plant Abiotic Stress Tolerance. "Tolerance to extreme heat is linked to mitochondrial metabolism", Vienna Austria, July 2018.

Gordon Research Conference: Chloroplasts and Mitochondria."Mitochondrial mTERF and ATAD3 Proteins in Arabidopsis". Selected from Abstracts. Il-Ciocco, Italy, July 2018.

Third International Workshop of Cell Stress Society International (CSSI). "sHSP Interactions with Substrates", Quebec City, Canada. Aug 2018.

14<sup>th</sup> International Conference on Reactive Oxygen and Nitrogen Species in Plants. "Mitochondrial mTERF Proteins and Stress Tolerance". Munich, Germany, July 2019.

Deutsche Forschung Gemeinschaft TRR175: Acclimation & Chloroplast Biology: from Genes to Systems. "Organelle Small Heat Shock Proteins", Irsee, Germany, August 2019.

ASBMB Annual Meeting: Theme Session Organizer and Chair, Philadelphia PA – April 2022.

## TEACHING

### U Mass

#### Formal Courses:

**BiochemHO1**: (Spr 11;13;14 Fall 12,13) 1 credit, ~30 students, 1 lecture

**Biochem694A** PB II - Topics in Plant Biology Research (Spr 11) 2 credits, 2 students, 1 lecture

**Bio 891PB**: Topics in Plant Biology Research (Fall 11; 12) 3 credits, ~15 students, 2 lectures

**Biochem 697A**: Protein Folding Journal Club, co-organizer (Fall 11, 12, Spr 13) 2 credits, ~18;~18; 6 students

**Biochem694A**: PB II - Topics in Plant Biology Research, 2 credits; Spr 12/13/14/15/16/17/19; 8/9/3/8/3/9/4 students

**Biochem 491H** – Junior Year Writing, 2 credits; Fall 12/13/15/16; 11/13/9/13 students

**Biochem 430H** - Biochemistry Writing Seminar, 3 credits; Fall 18/Spr 20; 12/17 students

**NatSci 494I** - Global Issues/Applied Biology, 3 credits (Spr 15/16; 83/59 students; co-taught 1/3 of class. Spr 17/19/20; 65-90 student,; taught 1/3 of course

#### Independent Studies:

Biochem 396 (Fall 2011/Spr 2012; 2/3 credits) **Brett Higgins**, BMB

Biochem 496 (Spr 2012; 3 credits) **Jonathan Barricelli**, BMB

Honors Capstone (Spr 2012; 3 credits) **Joshua Coomey**, PSIS Senior, Co-Advisor

Biochem 396H (Fall 2012; 3 credits) **Michelle Rousseau**, BMB

Biochem 296 (Spr 2013/Fall 2014;3/3 credits); Biochem 496 (Spr 2015; 3 credits) **Olena Gross**, BMB

Biochem 396 (Fall 2014/Spr 2015; 4/4 credits) **Mary Fowler**, BMB

Biochem 396 (Spr 2015; 2 credits) Biochem 396H (Spr 2016; 3 credits) **Chirag Mehta**, BMB

Chem 496 (Fall 2015/Spr 2016; 3/2 credits) Ian Truebridge, BMB

Biochem 496 (Spring 2016; 4 credits) **Sam Del'Olio**, BMB

Biochem 396H (Spr 2017; 3 credits) **Thi Bui**, BMB

Biochem 396H (Spr 2017) **Jesse Arsenault**, 3 credits

Biochem 396 (Spr 2017; 3 credits) Biochem 496 (Fall 2017/Spr 2018; 3/3 credits) **Corey Isgur**, BMB

Biochem 499Y (Fall 2017; 3 credits) **Thi Bui**, BMB

Biochem 396H (Spr 2018; 3 credits) Biochem 496H (Fall 2018; 3 credits) **Sam Zelman**, BMB

Biochem 396H (Spr 2018; 4 credits) **Esther Oh**, BMB

Biochem 296H (Fall 2018; 3 credits) **Lilly Voke**, Biology

Biochem 396H (Fall 2019) **Astha Parmar**, BMB

Biochem 296 (Fall 2019; 4 credits) 496 (Fall 2020. Spr 2021; 4 credits) **Philipp Guettler**, BMB

Biochem 496 (Fall 2019; 4 credits) **Eli Gordon**, BMB

Biochem 496H (Fall 2020/Spr 2021; 3/3 credits) **Nora Haggerty**, BMB

Biochem 496H (Fall 2020; 3 credits) **Elana Carleton**, BMB

Biochem 496 (Spr 2021; 3 credits) **Fabian Suri-Payer**, BMB

Biochem 496H (Spr 2021; 3 credits) **Yadwinder Kaur**, BMB

Biochem 396ISH (Fall 2021; 3 credits) **Dylan McLaughlin**, BMB

Biochem 396ISH (Fall 2021; 3 credits) **Lauren Velie**, BMB

#### Honors Theses:

Biochem 499Y/T (Spr 13/Fall 13; 3/3 credits) **Umaru Barrie**, BMB

Biochem 499Y/T (Fall 15/Spr 16; 6/6credits) **Mary Fowler**, BMB

Biochem499Y/T (Fall 15, Spr 16; 3/3credits) **Chirag Mehta**, BMB

Biochem499Y/T (Fall 16/Spr 17; 3/3 credits) **Alyssa McQuillan**, BMB

Biochem 499Y/T (Fall 17/Spr 18; 3/3 credits) **Jesse Arsenault**, BMB  
Biochem 499Y/T (Fall 18/Spr 19; 4/3 credits) **Esther Oh**, BMB  
Biochem 499T (Spr 19; 6 credits) **Parth Patel**, BMB  
Biochem 499Y/T (Fall 20/Spr 21; 4/4 credits) **Astha Parmar**, BMB  
Biochem 499Y/T (Fall 20/Spr 21; 3/4 credits) **Prem Patel**, BMB  
Biochem 499T (Spr 2021; 6 credits) **Elena Carleton**, BMB  
Biochem 499Y/T (Fall 21/Spr 22; 3/3 credits) **Nora Haggerty**, **Yadwinder Kaur**, **Fabian Suri-Payer**  
Biochem 499Y/T (Fall 22/Spr 23; 3/6 credits) **Lauren Velie**, BMB  
Biochem 499Y/T (Fall 21/Spr 22; 3/3 credits) **Samhitha Kumar**, **Dylan McLaughlin**, **Emma Peterson**

Undergraduate Student Awards (2019-to present):

Spr 2019 – Parth Patel, Honors Research Grant  
Spr 2019 – Esther Oh, Honors Research Grant  
Spr 20/Fall 20/Spr 21 – Nora Haggerty, Honors College Research Fellowship  
Spr 20/Fall 20/Spr 21 – Prem Patel, Honors College Research Grant  
Spr 20/Fall 20 – Astha Parmar, Honors College Research Grant  
Spr 21 – Nora Haggerty – BMB Dept Jessica Hayes Award  
Summer 21 – Yadwinder Kaur – BMB Dept Linda Slakey Award  
Spr 21 – Elana Carleton, Honors College Research Fellowship  
Fall 21/Spr22 – Nora Haggerty, Yadwinder Kaur; Honors Research Grant  
Fall 21/Spr22 – Lauren Velie, Dylan McLaughlin; Honors College Research Fellowship  
Spr 22 – Nora Haggerty – BMB Dept Leading Strand Award  
Spr 22 – Fabian Suri-Payer – BMB Dept Henry Little Award  
Spr 22 – Fabian Suri-Payer, Yadwinder Kaur BMB Dept Excellence in Biochemistry Award  
Spr 22 – Lauren Velie – BMB Dept Jessica Hayes Award  
Spr 22 – Emma Peterson – BMB Dept Linda Slakey Award  
Fall 22 – Emma Peterson, Lauren Velie, Dylan McLaughlin, Samhitha Kumar – Honors College  
Research Fellowship  
Spr 23 - Lauren Velie, Dylan McLaughlin, Samhitha Kumar – Honors College Research Fellowship  
Spr 23 – Lauren Velie, BMB Dept Henry Little Award  
Spr 23 – Dylan McLaughlin, Lauren Velie, BMB Excellence in Biochemistry Award

Graduate Program Participation:

Molecular and Cellular Biology (MCB) Program (weekly colloquia, weekly seminars)  
ICE IGERT (2011-15)  
Plant Biology (PB) program (weekly seminars)  
Chemistry Biology Interface (CBI) Program (monthly seminars); Training grant faculty – 2012-19  
CBI/BMB/BMP Joint Retreat, June 2011-13, 2015-17, 2019

Informal Presentations to Graduate Programs:

MCB Colloquium - Spring 2011  
ICE: Coffee and Connections - Spring 2011  
CBI Chalk Talk-Spring 2011, 2015, 2017, Fall 2019  
PB Graduate Student Program – Fall 2011, 2012  
MCB Graduate Student Program – Fall 2011, 2012, 2015  
BioTechTALES – BTP Training grant debate – Fall 2019

U Arizona (1995-2010)

**Biochemistry 462a** – Macromolecular structure/function Biochem majors (~110 students)

**Biochemistry 462b** - Metabolism for upper division Biochem majors (~100 students).

**Biochemistry 462bH** - Honors section of above.

**Biochemistry 461** - Nucleic acid biochemistry (for pharmacy, nursing, micro majors) (~140 students)

**Plant Sciences 561** - Biochemistry of photosynthesis & carbon metabolism (10-20 graduate students)

**Biochemistry 595c** - Current topics in biochem. & mol biol (8-15 MCB & Biochem graduate students).

## **GRADUATE STUDENTS**

### U Mass

PhD Advisor:

Keith Ballard – MCB PhD 2018

Visiting PhD Students:

Liyuan Zhang – Beijing Agricultural University, Beijing, China – 2016-17

Tianxiang Liu – NW Ag & Forestry University, Yangling, China – 2018-20

PhD Student Committees:

Alba Tannous – PhD Student of Daniel Hebert, MCB Program, degree 2015

Peter van Gisbergen – PhD student of Magdalena Bezanilla, degree 2016

Jing Lui – PhD student of Peter Chien, degree 2016

Greg Delulio – PhD Student of Li-Jun Ma, PB Program, Degree 2017

Onur Oznas – PhD student of Dong Wang, MCB program, degree 2016

Patrick Hill – PhD student of Kevin Griffith, MCB program

Ryan Shepard – PhD student of Om Parkash, PB program; left with terminal MS 2016

Joseph Tilitsky – PhD student of Lila Geirasch, Chemistry; Left with terminal MS 2017

Joshua Coomey – PhD student of Sam Hazen, PB program, Degree 2020

Nana Zhang – PhD Student at University of Pittsburgh, Stephen Tonsor advisor; degree 2016

Lingling Zhu – PhD student at Australian National University, Owen Atkin advisor; degree 2017

Jarrett Man – PhD student of Madelaine Bartlett, PB program; Degree Dec 2020

Afua Adusei – PhD student of Tricia Serio, MCB program; Left program with MS, 2022

Masters Students:

MS Advisor:

Yichen Zhang – MCB MS 2014; MS in statistics, bioinformatics Rutgers, 2016; Data Scientist, Wish, San Francisco

Nathen Bopp – Biochem, MS 2015 – Currently PhD student at UT Galveston

Sally Chu – Applied Biotech, MS 2014; employed in industry

William Scholl - Applied Biotech, MS 2016

Mary Fowler – Applied Biotech, MS 2017; Research Associate, Manus Biosynthesis

Ian Truebridge – Biochem MS 2018; Associate Scientist, AI Proteins, Inc., Andover MA

Sam Zelman – Biochem MS 2020; Research Scientist Odyssey Therapeutics

Parth Patel – Biochem MS 2020; U Central Florida Medical School

Eli Gordon – MCB MS 2021; Research Scientist, Palleon Pharmaceuticals, Waltham MA

Tracy Debenport – Applied Biotech MS 2021; UMass PhD student

MS Student committees:

Sarah Tarullo - MS 2014 (Scott Garman, Advisor)

Dennis DePaulo – MS 2014 (Sam Hazen, Advisor)

Kathryn Vescio – PB MS 2019 (Li-Jun Ma, Advisor); Technician, Heirloom Collective, Bernardston MA

Rotations (or qualifying exam - ORPs):

Keith Ballard – MCB, Summer 2011  
Tieyang Liu – MCB, Spring 2012  
Yichen Zhang – MCB, Spring 2012  
Thomas Sawyer – MCB, Fall 2014  
Jarrett Man – PB, Spring 2016  
Ahmet Bakirbas – PB, Spring 2018  
Nishadi Gamage – PB, Spring 2019  
Robert Yvon – (MCB ORP), Spring 2020

Undergraduate Thesis Committees - Member:

Joshua Coomey – PSIS Honors Thesis, May 2012  
Christopher Waters - BMB Honors Thesis, Wang Lab, May 2014  
Samantha Williams – BMB Honors Thesis, Gierasch Lab, May 2014  
Swarna Veeramani – BMB Honors Thesis, Mager Lab (VASCI), May 2015  
Laura Carlucci – Biology Honors Thesis, Baskin Lab, May 2016  
Thi Bui – BMB Honors Thesis, Katz Lab, Dec 2018

U AZ

Qiang Chen, PhD 1992. Professor, Dept of Applied Biological Sciences. AZ State University.  
Amy DeRocher, PhD 1993. Senior Staff Scientist, Seattle Biomedical Research Institute, Seattle, WA.  
Teri Suzuki, PhD 1998. Senior Research Scientist, Aventis Pharmaceuticals, Tucson, AZ  
Nadja (Wehmeyer) Anderson, PhD 1999. K-12 Biotech Outreach Coordinator, U of AZ, Tucson, AZ.  
Dee Willet, MS in Biology Teaching. 1999. Middle School Teacher, Tucson, AZ  
David Kim, M.S. 1999. Dean of Students, Albuquerque Academy High School, NM  
Kenny Friedrich, PhD 2003, Associate Professor, Portland Community College, OR.  
Guilong (Charles) Cheng, PhD 2007, (joint with Dr. Vicki Wysocki) Research Scientist, Amgen, MA.  
Nomalie Jaya, PhD 2009. Senior Scientist, Seattle Genetics, Bothell, WA  
Christina Jahr, MS 2010. High school teacher, CA.  
Minsoo Kim, PhD 2011. Research Scientist, Mootha Lab, Harvard

**POSTDOCTORAL RESEARCH ASSOCIATES**

Former:

Dr. Ricardo Azpiroz, Instructor, Richland College, Dallas, TX  
Dr. Kim Giese – RN, Princeton Health Care System, Ny, NY  
Dr. Damian Guerra – April 2013 to July 2016; Research Scientist, KBI Biopharma, Boulder CO  
Dr. Andrew Hausrath – Scientist, UCLA  
Dr. Kenneth Helm, Professor, Siena College, NY  
Dr. Suk-Whan Hong- Associate Professor, Chonnam University, Korea  
Dr. Surekha Katiyar-Agarwal – Associate Professor, University of New Delhi, New Delhi, India  
Dr. Minsoo Kim – Nov 2014 to 2021 – Research Scientist, Mass General Hospital, MA  
Dr. Jane Larkindale – Vice President, Clinical Science, Pepgen, Tucson, AZ  
Dr. Gary J. Lee – Former Monsanto Scientist; Luthier, Wayne, NJ  
Dr. Ung Lee – Humanitarian Farm Advisor  
Dr. Fionn McLoughlin – April 2012-Dec 2015; Scientist, Somalogic, Boulder CO  
Dr. Heather O’Neill – Senior Director, Caris Life Sciences, Phoenix, Arizona  
Dr. Katherine Osteryoung – Professor Emerita, Michigan State University  
Dr. Kerstin Petersen – Scientist, Max Planck Institute for Molecular Plant Physiology, Golm, Germany  
Dr. Indu Santhanagopalan – March 2011 to Nov 2016; Postdoc, Cambridge UK  
Dr. Elizabeth Waters, Professor, San Diego State University

Dr. Colin Watson, Neuroscience Regional Specialist, Pfizer, Tucson AZ

Dr. Shengbao Xu – Associate Professor, Northwest Ag & Forestry University, Yangling, China

Current:

Dr. Patrick Treffon – April 2018 - present

**VISITING SCIENTISTS** (Since 2004 – two prior):

Dr. Eman Basha – 2004 to 2012, from Tanta University, Tanta, Egypt

Dr. Kishor Gaikwad – 2009-10, from National Research Centre on Plant Biotechnology, Indian Agricultural Research Institute, New Delhi, India

Dr. Joel Stafstrom – Fall 2011, Professor, Department of Biological Sciences, Northern Illinois University.

Dr. Huiru Peng – Sept 2011- Sept 2012, Associate Professor, China Agricultural University, Beijing.  
Return visit planned 2020 – delayed by coronavirus

Dr. Alejandra Covarrubias – March 2014 – Sept 2014, Professor, UNAM, Cuernavaca, Mexico

**SERVICE** (1994 to present)

**Outreach:**

High School Science Fair Project Sponsor: 1995, 1999-2000

Sponsored two Salpointe High students who performed research in my lab.

Sponsored 3 students for 2000 Science Fair projects.

Sponsored High School Teachers for summer research: 2002 - 2007

Science Teachers Colloquium Presentation: 1997

Biology Career Day - Organizing committee: 1995, 1997, 1999, 2003

K-12 Outreach: Took the Manduca Project to my daughter's kindergarten and 1<sup>st</sup> grade classes.

Spoke to 5<sup>th</sup> grade class about DNA and cells, Spring 2003

Speaker, Science Career Day for middle school girls, March 2003

Presenter, Science Career Day for middle schoolers, Swanson Middle school, Arlington VA, Nov. 2008

Presenter, Thomas Jefferson Science Career Day, Arlington VA, 2009

High School Science Fair Judge, Arlington, VA, Feb. 2009

Presenter: Girls Excited about Math and Science, 6<sup>th</sup> grade Daniels Run Elementary, Falls Church, VA  
Jan. 2010

Eureka Program: Developed two-morning laboratory exercise for 15 year old girls from Holyoke Girls, Inc., UMass campus, Summer 2013; 2014.

Public Lectures: “GMOs: Science behind the Hype”, Amherst Town Hall, April 2014 (video recorded, shown on local TV and posted on Amherst town website); New Canaan, NY church group, May 2014; “Is there an upside to genetically modified plants?”, Amherst Town Hall, Nov 2014; “Science of meaningful GMO labeling” Speaker and panelist at forum sponsored by MA State Senator Brownsberger, Watertown, MA, October 2015; “The Science of Genetically Engineered Plants”, sponsored by the CT Valley section of the ACS, Amherst, MA, Oct 2015; “Where GMOs Stand Today” New England Vegetable and Fruit Conference, Manchester, NH, Dec 15, 2015; An evening with an expert, Hillel, Amherst, MA, Apr 2016. “Transgenic Plants: Basic research to agricultural applications”, Amherst Learning in Retirement, Hitchcock Center, Amherst MA, Dec 2017.

Organized “This is STEM in College” panel and campus shadowing day for Amherst Regional High school students (involved UMass undergrads); Spring 2014-17, 2019 (12-20 students each time).

Same event for Girl's Inc. of Holyoke for middle school girls (14 girls), Fall 2015, Spring 2017.

Sponsored a visiting student from the Czech Republic for a ten day visit and collaboration on the function of the enzyme GSNOR, Dec 2014.

Sponsored visiting postdoc from Australian National University, Canberra, for one week to perform pilot experiments on heat stress in grasses, June 2015.  
Sent a postdoc to Berlin, Germany for three weeks to learn new techniques and collaborate with an international partner, Feb 2015.  
Met with Boston Globe Editorial Board as expert to discuss MA GMO labeling bill, May 2016.  
Sponsored middle school science/math teacher Elliot Kelly to perform research and develop middle school curricula with plants (July-Aug 2016-2020), and Jodi Stevens (2018-2020). Work in summer 2020 involved teachers preparing on-line curricular materials for remote student learning.  
Teacher Workshops – Amherst Middle School, August 2017. Morning workshop on middle school science project with plants. Led by Elliott Kelly. Three teachers, one student teacher and one UMass graduate student. UMass STEM Workshop, March 2022. 12 high school teachers.  
Attended Elliot Kelly’s Amherst Middle School 8<sup>th</sup> grade classroom for “radish races” exercise (2017); and E. Kelly’s and Jodi Stevens 7<sup>th</sup> grade classroom to observe plant density lab (2018).  
Met with teachers from all three Amherst Elementary Schools and curriculum coordinator Jennifer Reece to introduce them to the plant growth rack system developed in previous years by Amherst middle school teacher Elliott Kelly. Purchased all components for setting up racks and growing plants with NSF funds, Nov 2019.  
Sponsored two public high school teachers and one private high school teacher for one week summer lab research, 2022.

### **Professional Training – Mentoring and Diversity, Equity & Inclusion**

Fall 2018 – Workshop on Mentoring – National Research Mentoring Network  
Fall 2019 – Implicit Bias Workshop  
July 2020 – Participated in CNS Discussion Group on the film “White Like Me”

### **Departmental Committees**

#### U AZ

Undergraduate Advising 1991 - 1996; 2004 to 2008  
Graduate Studies Committee 1995 - 2000. Chair from 1996-1999  
Biochemistry Department Executive Committee 1995-1998, 2005-2007  
Seminar Committee - 1999  
Curriculum Committee - 2002, 2003 to 2008  
Research Program Committee, Chair – 2006 to 2008

#### U Mass

BMB Departmental Personnel Committee: 2011 – 14, 2019; Chair 2012-13, 2013-14; Chair 2019-21  
Undergraduate Advising – Class of 2015 (~25 students), Class of 2019 (~33 students)  
Nordin Lecturer Committee – For Spring 2012, 2014, 2016  
Research Resources Committee – Spring 2012 - 2017  
Academic Affairs Committee – Fall 2014 – 2017  
Head’s Advisory Committee – Fall 2014 – 2017  
Faculty Search Committee - Fall 2014, Margaret Stratton hired.  
BMB Office Manager Search Committee – Chair – Fall 2015  
Faculty Search Committee, Chair – Summer 2016-2017, Sibongile Mafu hired.  
BMB Honors Program Director – 2019-21

### **University**

#### U AZ

Biochemistry Head Search Committee - 1996  
Graduate College Representative - 1995 -2003  
Faculty Senate - 2000 - 2005

Biochemistry Dept Head 5-yr Review Committee - 2001  
Research Policy Committee - 2002-2003  
Honors College Scholarship Board - 2004 - 2007  
College of Science P & T Committee – 2006

#### U Mass

Campus Physical Planning Council: Fall 2011-17  
Faculty Senate Outreach Council Subcommittee: 2011-15  
Broader Impacts Working Group (grant development advisory function): Spring 2011, Spring 2012  
Facilitator: Workshop on Broader Impacts in Grant Applications: Spring 2011, 2012  
Scribe: Workshop on Outreach and Engagement: Fall 2013.  
Plant Biology Program Graduate Admissions Committee: 2012 -17, 2019  
IALS Models to Medicine Steering Committee: 2013 - 2016.  
Interdepartmental Graduate Program Review Committee: 2015-16  
Plant Biology Graduate Program Director: 2015 to 2017; academic year 2018-19  
Co-Organizer -13<sup>th</sup> Annual UMass Plant Biology Symposium – Oct 2015  
Chair, Dean's CNS Plant Visioning Committee: 2015-16  
Life Sciences Steering Committee: 2015 - 17  
CNS Dean Search Committee: 2016  
IALS Core Facility Director Search Committee: 2016  
Graduate Education Innovation Working Group: 2019  
Commonwealth Honors College Council: 2019-22  
Plant Biology Graduate Program Graduate Operations Committee: Chair 2019-20  
Plant Biology Graduate Program Graduate Steering Committee: 2020-21  
Provost Professor Selection Committee - 2021

#### **Service to Profession:** (Selected)

##### International Service:

Advisory Board for the Gregor Mendel Institute of Plant Biology, Vienna, Austria. Appointed 2011-2106. Yearly board meetings.

Advisory Board for Marie Curie Initial Training Network SPOT-ITN, EU Project coordinated at Goethe University, Frankfurt, Germany. 2012-15. Yearly consortium meetings.

##### Editorial Positions

Editor - Plant Physiology, 1992 - 95

Editorial Board - Plant Molecular Biology, 2000 - 04

Editorial Board - Journal of Biological Chemistry, 2003-08

Editorial Board - Plant Journal, 2003-08

Reviewing Editor – Frontiers in Molecular Biosciences, Protein Folding, misfolding & degradation

##### Elected Offices

American Society for Cell Biology, Publications Committee, 1992-95.

American Society for Plant Physiologists, Executive Committee, 1995-97.

##### Committee Service

American Society for Plant Biologists, Charles Albert Shull Award Committee, 2005-08.

American Society for Plant Biologists, ASPB Pioneer Hi-Bred Graduate Student Fellowship Committee, 2009 - 15

American Society for Plant Biologists, Constitution and Bylaws Committee, 2020-23; Chair 2021-present.



### Grant and Program Review Panels (since 1994)

1994 USDA-NRICGP - Plant Responses to the Environment  
1995 NIH Molecular Cytology Study Section, Ad Hoc reviewer  
1996 American Cancer Society - Personnel grants  
1999 USDA-NRICGP - Plant Development  
2000 USDA-NRICGP - Plant Responses to the Environment  
2002 DOE - Energy Biosciences  
2004-5 USDA-NRICGP - Panel Manager, Plant Responses to the Environment  
2005 DOE – MSU Plant Research Lab Site Review  
2011 NSF – MCB Signal Transduction Panel  
2012 NIH – MSFB Study Section, Ad Hoc  
2014 VA Tech – Review of Department of Plant Pathology, Physiology and Weed Science  
2014 NIFA – USDA - Plant Growth, Development, Composition and Stress Tolerance  
2016 NSF – PhD Dissertation award panel  
2021 NSF – MCB, May  
2021 NSF – MCB, November  
2023 NSF – MCB, March

### Membership in Professional Societies

American Society for Biochemistry and Molecular Biology - 1997 to present  
American Association for the Advancement of Science - 1985 to present  
American Society for Cell Biology - 1978 to 2004  
American Society of Plant Biologists - 1977 to present

### Meeting organization/chair positions:

#### Keystone Conferences:

Chair, Plant Responses to Abiotic Stress. Copper Mountain CO, April 2006  
Co-Chair, Plant Responses to Abiotic Stress. Santa Fe, NM, February, 2004.  
Gordon Research Conference: Chair, Plant Responses to Temperature: January, 2006  
National Science Foundation: Cochair, Workshop on Innovation in Biological Research and Education in the Molecular and Cellular Biosciences, Arlington, VA, June 2010.  
ASPB Annual Meeting: Minisymposium Chair, Minneapolis, MN, August 2011.  
Minisymposium Chair, Providence, R.I. July 2013.  
ASBMB Annual Meeting: Theme Session Organizer (12 speakers); Session Chair, Philadelphia PA, Apr 2022.

## **GRANTS AND CONTRACTS**

### Active :

#### **National Science Foundation – MCB 2215727**

8/15/22-7/31/26 \$765,591

“Collaborative Research: Defining functions of an essential, conserved protein that uniquely links the mitochondrial matrix with the cytoplasm”

#### **Alexander Von Humboldt Senior Research Award**

6/24/07- open € 50,000

Sabbatical research support

“Metabolism of Nitric Oxide – Impact on carbon and nitrogen metabolism and stress responses”

**Previous Awards: (since 1994)**

**Federal:**

**National Science Foundation – MCB 1817985**

8/01/18- 1/31/24 \$800,000

“Regulating Nitric Oxide Homeostasis and its Impact on Plant Growth and Reproduction”

**National Science Foundation – IOS 1354960**

6/1/2014 -5/31/2020 \$800,000

“mTERF function in the control of plant respiration and stress tolerance”

**National Science Foundation - MCB 1517046**

7/15/15-7/14/2019 \$682,357

“Linking Reactive Nitrogen Metabolism and Redox Homeostasis in Plants”

**National Institutes of Health**

**RO1 GM42762** \$1,306,082 (direct plus indirect)

9/1/11-8/31/16

"Structure and function of the small heat shock proteins".

**DOE - Energy Biosciences Program**

8/1/11-7/31/12 \$186,109 (direct plus indirect)

Hsp100/ClpB Chaperone Function and Mechanism

**USDA-CSREES-NRI-001030 UMASS 2008-35318-31202**

09/1/08-08/31/13 \$400,000 total for all years (direct plus indirect)

“Function and regulation of a key enzyme in nitric oxide metabolism: S-nitrosoglutathione reductase”

**NSF DBI - 0820047**

03/01/09-02/28/13 \$429,700 (direct plus indirect to EV – subcontract still at U AZ)

Dan Gallie, UC Riverside, PI

“Arabidopsis 2010: Global analysis of translational regulation”

**NSF POWRE Award: MCB-9752978**

1997 \$4,500 a Merit Award

“A genetic approach to structure and function analysis of a new class of molecular chaperones”

**USDA NRICGP 96-351003232**

9/15/96 - 9/14/99 \$230,000 total for project period

"Class I small HSPs in Plant Development and Thermotolerance"

**USDA NRICGP 93-02143**

9/1/93 -8/31/96 \$190,000 total for project period

"Role of Class I Small HSPs in Development and Thermotolerance"

**USDA NRICGP 99-351007618**

9/15/99 - 9/14/02 \$200,000 total for project period

“Plant Thermotolerance: The role of small heat shock proteins and other factors”

**USDA-NRICGP 3510014857**

9/1/04-8/31/07 \$420,000 total costs  
"Genes and gene networks controlling tolerance to high temperature"

**DOE - Basic Energy Biosciences DE-FG03-95ER20208**

9/1/95- 2/28/98 - \$150,000 total costs  
"Role of Hsp100 proteins in plant stress tolerance"

**DOE - Energy Biosciences Program**

9/16/99-9/14/02 \$100,000/yr direct plus indirect  
"Cytosolic HSP100 Proteins and Stress Tolerance in Plants"

**DOE - Energy Biosciences Program**

9/16/02-9/14/05 \$100,000/yr direct plus indirect  
"Cytosolic HSP100 Proteins and Stress Tolerance in Plants"

**DOE - Energy Biosciences Program**

9/15/05-9/14/08 \$470,000 total for all years, direct plus indirect.  
"Cytosolic HSP100 Proteins and Stress Tolerance in Plants"

**NIH R01 GM42762-01**

7/1/89-6/30/94 - \$770,175 (Total direct plus indirect costs)  
"Expression and Function of Organelle Heat Shock Proteins"

**NIH R01 GM42762**

7/1/95-6/30/99 - \$775,000 (Total direct plus indirect costs)  
"Structure and Function of Small Heat Shock Proteins"

**NIH RO1 GM42762**

7/1/00-6/30/05 ~\$800,000 (Total direct plus indirect costs)  
"Structure and function of the small heat shock proteins"

**University of Arizona Hatch funds.**

1994 -1998 approx. \$15,000/yr (Direct costs)  
"The Roles of Heat Shock Proteins in Plant Thermotolerance."

**USDA-Southwest Consortium for Plant Genetics and Water Resources**

Co PIs - J.J. Burke, USDA, Lubbock Texas  
9/00-9/01 15% effort \$14,000 direct costs  
"Identification of Arabidopsis mutants with altered thermotolerance"

**NSF POWRE Program**

8/1/00-7/31/01 \$75,000 direct plus indirect support (Sabbatical salary support)  
"QTL Mapping of heat tolerance traits in Arabidopsis"

**NSF: IBN-0213128**

10/1/02-9/30/06 \$120/yr direct plus indirect + REU and RET supplements.  
"Function of the small Hsps in stress tolerance, growth and development"

**NSF REU- DBI-0551115**

CoPi: Carol Bender

4/1/06-3/31/09 \$237,000

“REU Site: Research Experiences for Undergraduates in Molecular Biosciences”

**NIH - Fogarty Award** Collaboration with Dr. Laszlo Vigh, Szeged Hungary.

9/1/03 - 8/31/06 Funds, with the exception of some overhead, essentially all go to collaborator

“Lipid interactions of small heat shock proteins”

**International:**

**Japanese Society for the Promotion of Science:**

Short-term Invitation Fellowship for Research In Japan.

Award 1997. Supported full cost of 10-day trip to Japanese Universities.

**Dutch National Science Foundation**

8/1/00-7/31/01 \$18,000 direct (Sabbatical living support)

“Genetics of stress tolerance in Arabidopsis”

**AMVIS – Czech-American Cooperation**

2011-2014 All research funds to Czech partner. Supported exchange of EV to Czech Republic, and Czech students to US.

PI: Marek Petřivalský

“Plant GSNOR”

**State:**

**UMass President’s Fund for Science & Technology**

Co-PI: Susan Roberts, Chemical Engineering

7/1/2014 – 6/31/2016 \$150,000 (\$100,000 matching from UMass)

“Massachusetts BioFoundry: A Center for the Discovery and Synthesis of Bioreactive Natural Products”

**UMass Agriculture Experiment Station – Hatch Project MAS00566**

NIFA – National Institute of Food and Agriculture – Project # 1024718

10/5/2020-9/30/2023 \$ depending on funds available to the Department

“Function of Chloroplast and Mitochondrial Small Heat Shock Protein in Stress Tolerance”

**Private:**

**American Cancer Society Faculty Research Award (#FRA-420).**

1992 - 1997 - Direct costs 5 yrs. \$ 205,000.

"Roles of LMW HSPs in Eukaryotes".

**John Simon Guggenheim Memorial Fellowship**

8/1/00-7/31/01 \$34,000 direct

“Genes for heat tolerance in agriculture” (Sabbatical salary support)