Stanford

Wolf B. Frommer

Bio

ACADEMIC APPOINTMENTS

- Member, Bio-X

ADMINISTRATIVE APPOINTMENTS

- Group leader, IGF, Berlin, Germany, (1990-1992)
- Young Investigator. Assist. Professor, IGF, Berlin, Germany, (1992-1996)
- Full Professor, Chair, Plant Physiology, University of Tübingen, Germany, (1996-2003)
- Director, Center for Plant Molecular Biology, ZMBP, Tübingen, Germany, (1997-2001)
- Professor by Courtesy, Stanford University, (2003-2009)
- Staff Member, Carnegie Institution for Science, Stanford, (2003- present)
- Vice President, Feedstocks, Joint Bioenergy Institute, Emeryville, (2007-2009)
- Director, Carnegie Institution for Science, Dep. Plant Biology, (2007-2016)
- Full Professor, Stanford University, (2009-2016)
- Professor (by courtesy), Stanford University, (2016- present)

HONORS AND AWARDS

- Young investigator Award, German Federal Ministry for Science and Technology (1992)
- Gottfried-Wilhelm-Leibniz Preis, German Research Foundation (DFG) (1998)
- European Science Award, Körber Foundation (2001)
- Fellow, American Association for the Advancement of Science (2003)
- Laurence Bogorad Award for Excellence in Plant Biology Research, American Society of Plant Biology (2012)
- Member, German Academy of Sciences, Leopoldina (2015)

BOARDS, ADVISORY COMMITTEES, PROFESSIONAL ORGANIZATIONS

- Member, ASPB (1996 - present)
- Fellow, American Association for the Advancement of Science (2003 - present)
- Member, San Francisco Microscopical Society (2011 - present)
- Member, American Society of Cell Biology (2014 - present)

PROFESSIONAL EDUCATION

- Habilitation, Free University Berlin , Plant Physiology (1994)
- Dr. rer. nat., University Köln , Biology (1987)
- Diploma, University Köln, Germany , Biology (1983)

PATENTS

- Hirner A., Koch W., Tegeder M. & Frommer W.B.. "United States Patent 2005235376 Method for producing a transgenic plant having modified transport of substances. (2002)"
- Wolf Frommer, Sylvie Lalonde. "Japan Patent 5148498 Phosphate sensor. (2009)"
- Okumoto S., Looger L.L. & Frommer W.B.. "United States Patent 7,777,016 Neurotransmitter Sensors and Methods of Using Same. (2008)"
- Thijs Kaper, Michael Platten, Lavvrence Steinman, Wolf Frommer. "United States Patent 7,935,494 TRP/HIS exchange and KYNURENINE induced TRP transport. (2008)"
- Wolf Frommer, Ida Large. "United States Patent 8,173,863 Sucrose biosensors and methods of using the same. (2009)"
- Wolf Frommer, Loren L. Looger. "United States Patent 8,357,505 Environmentally stable sensors and methods of using the same. (2009)"
- Wolf Frommer, Sakiko Okumoto, Loren Looger, Marcus Fehr. "United States Patent 8,530,633 Development of Sensitive FRET sensor and methods of using the seim. (2010)"
- Wolf Frommer, Marcus Fehr, Sylvie Lalonde. " Patent European Patent Convention 1427856 Fusion Proteins Useful For Detecting analysis. (2004)"
- Fischer W.N., Frommer W.B., Hirner B., Lalonde S., Okumoto S., Tegeder M., Ward J.M. & Weise A.. "Germany Patent P 00109218.8-2105 Modification of gene expression in transgenic plants. (2000)"
- Deuschle K., Funck D., Hellmann H. & Frommer W.B.. "Germany Patent P 00116866.5-2105 Plant protein with pyrroline-5-carboxylat-dehydrogenase activity. (2000)"
- Catoni E., Schwab R., Schumacher K. & Frommer W.B.. "Germany Patent P 100 36 671.6 Nucleic Acids, with the aid of which plants having an altered metabolite content can be produced. (2000)"
- Ward J.M., Weise A., Barker L., Schulze W., Kühn C. & Frommer W.B.. "Germany Patent P 10050233.4-41 Gentechnisch veränderte Zuckerrübe. (2000)"
- Schrader H., Elling L. & Frommer W.B.. "Germany Patent P 197 36 343.1-41 Methods for increasing the gene expression of saccharose synthase. (1997)"
- Gillissen B., Bürkle L., André B. & Frommer W.B.. "Germany Patent P 199 072 09.4-4 Nucleic acids which code for nuclear base transporters. (1999)"
- Rocha-Sosa M., Sonnewald U., Frommer W.B., Willmitzer L. & Stratmann M.. "Germany Patent P 38 43 627.2 Plant promoters specific for sink organ expression of genes. (1988)"
- Frommer W.B., Riesmeier J.W.. "Germany Patent P 42 20 759.2 DNA sequences with oligosaccharide transporter, plasmids bacteria and plants containing a transporter as well as a process for the preparation and transformation of yeast strains for identification of the transporter.(1992)"
- Wolf Frommer. "Germany Patent P 42 22 315.6 DNA sequences for an arabidopsis amino acid transporter, plasmids, bacteria, yeasts and plants containing a transporter and their use. (1992)"
- Frommer W.B., Ninnemann O.. "Germany Patent P 43 37 597.9 DNA sequences for ammonium transporter, plasmids, bacteria, yeasts, plant cells and plants containing the transporter. (1993)"
- Frommer W.B., Streber W., Kwart M., Ninnemann O. & Riesmeier J.W.. "Germany Patent P 43 43 527.0 Methods for identifying substances with a potential herbicidal or growth-regulating action by means of plant transporter proteins, the use of the transporter proteins, and substances with a herbicidal and growth-regulating action. (1993)"
- Riesmeier J.W. & Frommer W.B.. "Germany Patent P 44 39 748.8 Process for modifying plant flowering behavior. (1994)"

LINKS

- our department and my lab: http://dpb.carnegiescience.edu/

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

The goal of the group is to carry out a comparative analysis of carbon and nitrogen transport and metabolism and its regulation using a fluxomics approach. FRET sensors are used to measure the effect of individual genes (in high throughput) on flux. Model organisms/systems to be compared are yeast cells, mammalian cell cultures and intact roots of Arabidopsis. The goal to to uncover regulatory networks controlling flux through the metabolic pathways in order to provide a solid basis for metabolic engineering. In parallel, high throughput approaches are used to analyze the physical interaction network of membrane proteins (including receptors and transporters) with the signaling networks. In addition phosphoproteomics is being used to determine the changes in phosphorylation patterns induced by chanegs in nutrient supply. These three major approaches are used to generate an advanced network of carbon and nitrogen signaling.

Teaching

GRADUATE AND FELLOWSHIP PROGRAM AFFILIATIONS

- Biology (School of Humanities and Sciences) (Phd Program)

Publications

PUBLICATIONS

- **Using Genetically Encoded Fluorescent Biosensors for Quantitative In Vivo Imaging.** *Methods in molecular biology (Clifton, N.J.)*
  Yoshinari, A., Moe-Lange, J., Kleist, T. J., Cartwright, H. N., Quint, D. A., Ehrhardt, D. W., Frommer, W. B., Nakamura, M.
  2021; 2200: 303–22
- **SWEET11 and 15 as key players in seed filling in rice** *NEW PHYTOLOGIST*
  Yang, J., Luo, D., Yang, B., Frommer, W. B., Eom, J.
  2018; 218 (2): 604–15
- **Impaired phloem loading in zmsweet13a,b,c sucrose transporter triple knock-out mutants in Zea mays** *NEW PHYTOLOGIST*
  Bezrutczyk, M., Hartwig, T., Horschman, M., Char, S., Yang, J., Yang, B., Frommer, W. B., Sosso, D.
  2018; 218 (2): 594–603
- **TAL effector driven induction of a SWEET gene confers susceptibility to bacterial blight of cotton** *NATURE COMMUNICATIONS*
  Cox, K. L., Meng, F., Wilkins, K. E., Li, F., Wang, P., Booher, N. J., Carpenter, S. C., Chen, L., Zheng, H., Gao, X., Zheng, Y., Fei, Z., Yu, et al
  2017; 8
- **Mechanism of Substrate Translocation in an Alternating Access Transporter** *CELL*
  Latorraca, N. R., Fastman, N. M., Venkatakrishnan, A. J., Frommer, W. B., Dror, R. O., Feng, L.
  2017; 169 (1): 96-?
- **Molecular Characterization of LjSWEET3, a Sugar Transporter in Nodules of Lotus japonicus** *PLANT AND CELL PHYSIOLOGY*
  Sugiyama, A., Saida, Y., Yoshimizu, M., Takanashi, K., Sosso, D., Frommer, W. B., Yazaki, K.
  2017; 58 (2): 298-306
- **Ratiometric Matryoshka biosensors from a nested cassette of green- and orange-emitting fluorescent proteins.** *Nature communications*
  Ast, C. n., Foret, J. n., Oltrogge, L. M., De Michele, R. n., Kleist, T. J., Ho, C. H., Frommer, W. B.
  2017; 8 (1): 431
- **Phylogenetic evidence for a fusion of archaeal and bacterial SemiSWEETs to form eukaryotic SWEETs and identification of SWEET hexose transporters in the amphibian chytrid pathogen Batrachochytrium dendrobatidis** *FASEB JOURNAL*
  Hu, Y., Sosso, D., Qu, X., Chen, L., Ma, L., Chermak, D., Zhang, D., Frommer, W. B.
  2016; 30 (10): 3644-3654
- **MtSWEET11, a Nodule-Specific Sucrose Transporter of Medicago truncatula** *PLANT PHYSIOLOGY*
  Kryvoruchko, I. S., Sinharoy, S., Torres-Jerez, I., Sosso, D., Pislariu, C. I., Guan, D., Murray, J., Benedito, V. A., Frommer, W. B., Udvardi, M. K.

2016; 171 (1): 554-565

- **Free-Flow Electrophoresis of Plasma Membrane Vesicles Enriched by Two-Phase Partitioning Enhances the Quality of the Proteome from Arabidopsis Seedlings.** *Journal of proteome research*
  De Michele, R., McFarlane, H. E., Parsons, H. T., Meents, M. J., Lao, J., González Fernández-Niño, S. M., Petzold, C. J., Frommer, W. B., Samuels, A. L., Heazlewood, J. L.
  2016; 15 (3): 900-913

- **50 years of Arabidopsis research: highlights and future directions** *NEW PHYTOLOGIST*
  Provart, N. J., Alonso, J., Assmann, S. M., Bergmann, D., Brady, S. M., Brkljacic, J., Browse, J., Chapple, C., Colot, V., Cutler, S., Dangl, J., Ehrhardt, D., Friesner, et al
  2016; 209 (3): 921-944

- **Evolution of Transporters: The Relationship of SWEETs, PQ-loop, and PnuC Transporters.** *Trends in biochemical sciences*
  Feng, L., Frommer, W. B.
  2016; 41 (2): 118-119

- **FRET sensor-based quantification of intracellular trehalose in mammalian cells** *BIOSCIENCE BIOTECHNOLOGY AND BIOCHEMISTRY*
  Kikuta, S., Hou, B., Sato, R., Frommer, W. B., Kikawada, T.
  2016; 80 (1): 162-165

- **Seed filling in domesticated maize and rice depends on SWEET-mediated hexose transport.** *Nature genetics*
  Sosso, D., Luo, D., Li, Q., Sasse, J., Yang, J., Gendrot, G., Suzuki, M., Koch, K. E., McCarty, D. R., Chourey, P. S., Rogowsky, P. M., Ross-Ibarra, J., Yang, et al
  2015; 47 (12): 1489-1493

- **Deciphering durable resistance one R gene at a time.** *Nature genetics*
  White, F. F., Frommer, W.
  2015; 47 (12): 1376-7

- **Seed filling in domesticated maize and rice depends on SWEET-mediated hexose transport.** *Nature genetics*
  Sosso, D., Luo, D., Li, Q., Sasse, J., Yang, J., Gendrot, G., Suzuki, M., Koch, K. E., McCarty, D. R., Chourey, P. S., Rogowsky, P. M., Ross-Ibarra, J., Yang, et al
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- **Structure of a eukaryotic SWEET transporter in a homotrimeric complex.** *Nature*
  Tao, Y., Cheung, L. S., Li, S., Eom, J., Chen, L., Xu, Y., Perry, K., Frommer, W. B., Feng, L.
  2015; 527 (7577): 259-263

- **Structure of a eukaryotic SWEET transporter in a homotrimeric complex** *NATURE*
  Tao, Y., Cheung, L. S., Li, S., Eom, J., Chen, L., Xu, Y., Perry, K., Frommer, W. B., Feng, L.
  2015; 527 (7577): 259-?

- **The Arabidopsis vacuolar sugar transporter SWEET2 limits carbon sequestration from roots and restricts Pythium infection** *PLANT JOURNAL*
  Chen, H., Huh, J., Yu, Y., Ho, L., Chen, L., Tholl, D., Frommer, W. B., Guo, W.
  2015; 83 (6): 1046-1058

- **Structure and function of SemiSWEET and SWEET sugar transporters** *TRENDS IN BIOCHEMICAL SCIENCES*
  Feng, L., Frommer, W. B.
  2015; 40 (8): 480-486

- **Structure and function of SemiSWEET and SWEET sugar transporters.** *Trends in biochemical sciences*
  Feng, L., Frommer, W. B.
  2015; 40 (8): 480-6

- **SWEETs, transporters for intracellular and intercellular sugar translocation** *CURRENT OPINION IN PLANT BIOLOGY*
  Eom, J., Chen, L., Sosso, D., Julius, B. T., Lin, I. W., Qu, X., Braun, D. M., Frommer, W. B.
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- **Gene targeting by the TAL effector PthXo2 reveals cryptic resistance gene for bacterial blight of rice** *PLANT JOURNAL*

Zhou, J., Peng, Z., Long, J., Sosso, D., Liu, B., Eom, J., Huang, S., Liu, S., Vera Cruz, C., Frommer, W. B., White, F. F., Yang, B.
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- **Identification of rice cornichon as a possible cargo receptor for the Golgi-localized sodium transporter OsHKT1;3.** *Journal of experimental botany*
  Rosas-Santiago, P., Lagunas-Gómez, D., Barkla, B. J., Vera-Estrella, R., Lalonde, S., Jones, A., Frommer, W. B., Zimmermannova, O., Sychrová, H., Pantoja, O.
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- **A cascade of sequentially expressed sucrose transporters in the seed coat and endosperm provides nutrition for the Arabidopsis embryo.** *Plant cell*
  Chen, L., Lin, I. W., Qu, X., Sosso, D., McFarlane, H. E., Londoño, A., Samuels, A. L., Frommer, W. B.
  2015; 27 (3): 607-619
- **FRET sensor-based quantification of intracellular trehalose in mammalian cells.** *Bioscience, biotechnology, and biochemistry*
  Kikuta, S., Hou, B., Sato, R., Frommer, W. B., Kikawada, T.
  2015; 80 (1): 162-165
- **Transport of Sugars** *ANNUAL REVIEW OF BIOCHEMISTRY, VOL 84*
  Chen, L., Cheung, L. S., Feng, L., Tanner, W., Frommer, W. B.
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- **Single-fluorophore membrane transport activity sensors with dual-emission read-out.** *eLife*
  Ast, C., De Michele, R., Kumke, M. U., Frommer, W. B.
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- **Structures of bacterial homologues of SWEET transporters in two distinct conformations** *NATURE*
  Xu, Y., Tao, Y., Cheung, L. S., Fan, C., Chen, L., Xu, S., Perry, K., Frommer, W. B., Feng, L.
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- **Xanthomonas axonopodis Virulence Is Promoted by a Transcription Activator-Like Effector Mediated Induction of a SWEET Sugar Transporter in Cassava** *MOLECULAR PLANT-MICROBE INTERACTIONS*
  Cohn, M., Bart, R. S., Shybut, M., Dahlbeck, D., Gomez, M., Morbitzer, R., Hou, B., Frommer, W. B., Lahaye, T., Staskawicz, B. J.
  2014; 27 (11): 1186-1198
- **Border Control-A Membrane-Linked Interactome of Arabidopsis** *SCIENCE*
  Jones, A. M., Xuan, Y., Xu, M., Wang, R., Ho, C., Lalonde, S., You, C. H., Sardi, M. I., Parsa, S. A., Smith-Valle, E., Su, T., Frazer, K. A., Pilot, et al
  2014; 344 (6185): 711-716
- **Nectar secretion requires sucrose phosphate synthases and the sugar transporter SWEET9.** *Nature*
  Lin, I. W., Sosso, D., Chen, L., Gase, K., Kim, S., Kessler, D., Klinkenberg, P. M., Gorder, M. K., Hou, B., Qu, X., Carter, C. J., Baldwin, I. T., Frommer, et al
  2014; 508 (7497): 546-549
- **Fluorescent sensors for activity and regulation of the nitrate transceptor CHL1/NRT1.1 and oligopeptide transporters** *ELIFE*
  Ho, C., Frommer, W. B.
  2014; 3
- **Mitochondrial biosensors.** *international journal of biochemistry & cell biology*
  De Michele, R., Carimi, F., Frommer, W. B.
  2014; 48: 39-44
- **Lateral organ boundaries 1 is a disease susceptibility gene for citrus bacterial canker disease.** *Proceedings of the National Academy of Sciences of the United States of America*
  Hu, Y., Zhang, J., Jia, H., Sosso, D., Li, T., Frommer, W. B., Yang, B., White, F. F., Wang, N., Jones, J. B.
  2014; 111 (4): E521-9
- **Determination of glucose flux in live myoblasts by microfluidic nanosensing and mathematical modeling.** *Integrative biology : quantitative biosciences from nano to macro*
  Zambon, A., Zoso, A., Luni, C., Frommer, W. B., Elvassore, N.
  2014

- **Dynamic imaging of cytosolic zinc in Arabidopsis roots combining FRET sensors and RootChip technology** *New Phytologist*
  Lanquar, V., Grossmann, G., Vinkenborg, J. L., Merkx, M., Thomine, S., Frommer, W. B.
  2014; 202: 198-208
- **Male-female communication triggers calcium signatures during fertilization in Arabidopsis.** *Nature communications*
  Denninger, P., Bleckmann, A., Lausser, A., Vogler, F., Ott, T., Ehrhardt, D. W., Frommer, W. B., Sprunck, S., Dresselhaus, T., Grossmann, G.
  2014; 5: 4645-?
- **Abscisic acid dynamics in roots detected with genetically encoded FRET sensors.** *eLife*
  Jones, A. M., Danielson, J. A., Manojkumar, S. N., Lanquar, V., Grossmann, G., Frommer, W. B.
  2014; 3
- **SWEET17, a Facilitative Transporter, Mediates Fructose Transport across the Tonoplast of Arabidopsis Roots and Leaves** *Plant Biologists*
  Guo, W. J., Nagy, R., Chen, H. Y., Pfrunder, S., Yu, Y. C., Santelia, D., Frommer, W. B., Martinoia, E.
  2014; 164 (2): 777-789
- **Functional role of oligomerization for bacterial and plant SWEET sugar transporter family.** *Proceedings of the National Academy of Sciences of the United States of America*
  Xuan, Y. H., Hu, Y. B., Chen, L., Sosso, D., Ducat, D. C., Hou, B., Frommer, W. B.
  2013; 110 (39): E3685-94
- **Fluorescent sensors reporting the activity of ammonium transceptors in live cells** *ELIFE*
  De Michele, R., Ast, C., Loque, D., Ho, C., Andrade, S. L., Lanquar, V., Grossmann, G., Gehne, S., Kumke, M. U., Frommer, W. B.
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- **Differential regulation of glucose transport activity in yeast by specific cAMP signatures** *BIOCHEMICAL JOURNAL*
  Bermejo, C., Haerizadeh, F., Sadoine, M. S., Chermak, D., Frommer, W. B.
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- **Using membrane transporters to improve crops for sustainable food production.** *Nature*
  Schroeder, J. I., Delhaize, E., Frommer, W. B., Guerinot, M. L., Harrison, M. J., Herrera-Estrella, L., Horie, T., Kochian, L. V., Munns, R., Nishizawa, N. K., Tsay, Y., Sanders, D.
  2013; 497 (7447): 60-66
- **SPATIOTEMPORAL RESOLUTION OF BDNF NEUROPROTECTION AGAINST GLUTAMATE EXCITOTOXICITY IN CULTURED HIPPOCAMPAL NEURONS** *NEUROSCIENCE*
  Melo, C. V., Okumoto, S., Gomes, J. R., Baptista, M. S., Bahr, B. A., Frommer, W. B., Duarte, C. B.
  2013; 237: 66-86
- **Allosteric regulation of transport activity by heterotrimerization of Arabidopsis ammonium transporter complexes in vivo.** *Plant cell*
  Yuan, L., Gu, R., Xuan, Y., Smith-Valle, E., Loqué, D., Frommer, W. B., von Wirén, N.
  2013; 25 (3): 974-984
- **Plant science. Jack of all trades, master of flowering.** *Science*
  Danielson, J. Å., Frommer, W. B.
  2013; 339 (6120): 659-660
- **A genetically encoded FRET lactate sensor and its use to detect the Warburg effect in single cancer cells.** *PloS one*
  San Martín, A., Ceballo, S., Ruminot, I., Lerchundi, R., Frommer, W. B., Barros, L. F.
  2013; 8 (2)
- **Paramutation-Like Interaction of T-DNA Loci in Arabidopsis** *PLOS ONE*
  Xue, W., Ruprecht, C., Street, N., Hematy, K., Chang, C., Frommer, W. B., Persson, S., Niittyla, T.
  2012; 7 (12)
- **Time-lapse Fluorescence Imaging of Arabidopsis Root Growth with Rapid Manipulation of The Root Environment Using The RootChip** *JOVE-JOURNAL OF VISUALIZED EXPERIMENTS*

Grossmann, G., Meier, M., Cartwright, H. N., Sosso, D., Quake, S. R., Ehrhardt, D. W., Frommer, W. B.
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- **A never ending race for new and improved fluorescent proteins** *BMC BIOLOGY*
  Jones, A. M., Ehrhardt, D. W., Frommer, W. B.
  2012; 10
- **The Ubiquitin E3 Ligase LOSS OF GDU2 Is Required for GLUTAMINE DUMPER1-Induced Amino Acid Secretion in Arabidopsis** *PLANT PHYSIOLOGY*
  Pratelli, R., Guerra, D. D., Yu, S., Wogulis, M., Kraft, E., Frommer, W. B., Callis, J., Pilot, G.
  2012; 158 (4): 1628-1642
- **New Technologies for 21st Century Plant Science** *PLANT CELL*
  Ehrhardt, D. W., Frommer, W. B.
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  Chen, L., Qu, X., Hou, B., Sosso, D., Osorio, S., Fernie, A. R., Frommer, W. B.
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- **Amino Acid transporter inventory of the selaginella genome.** *Frontiers in plant science*
  Wipf, D., Loqué, D., Lalonde, S., Frommer, W. B.
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- **SUT sucrose and MST monosaccharide transporter inventory of the Selaginella genome** *FRONTIERS IN PLANT SCIENCE*
  Lalonde, S., Frommer, W. B.
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  De Michele, R., Loqué, D., Lalonde, S., Frommer, W. B.
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- **Quantitative Imaging with Fluorescent Biosensors** *ANNUAL REVIEW OF PLANT BIOLOGY, VOL 63*
  Okumoto, S., Jones, A., Frommer, W. B.
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  Brutnell, T., Frommer, W.B.
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- **Uncovering Arabidopsis membrane protein interactome enriched in transporters using mating-based split ubiquitin assays and classification models.** *Frontiers in plant science*
  Chen, J., Lalonde, S., Obrdlik, P., Noorani Vatani, A., Parsa, S. A., Vilarino, C., Revuelta, J. L., Frommer, W. B., Rhee, S. Y.
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  Ewald, J. C., Reich, S., Baumann, S., Frommer, W. B., Zamboni, N.
  2011; 6 (12)
- **The RootChip: An Integrated Microfluidic Chip for Plant Science** *PLANT CELL*
  Grossmann, G., Guo, W., Ehrhardt, D. W., Frommer, W. B., Sit, R. V., Quake, S. R., Meier, M.
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- **Optical sensors for monitoring dynamic changes of intracellular metabolite levels in mammalian cells** *NATURE PROTOCOLS*
  Hou, B., Takanaga, H., Grossmann, G., Chen, L., Qu, X., Jones, A. M., Lalonde, S., Schweissgut, O., Wiechert, W., Frommer, W. B.
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- **Optical sensors for measuring dynamic changes of cytosolic metabolite levels in yeast** *NATURE PROTOCOLS*
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- **In VIVO biochemistry: quantifying ion and metabolite levels in individual cells or cultures of yeast** *BIOCHEMICAL JOURNAL*
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- **Dynamic imaging of glucose flux impedance using FRET sensors in wild-type Arabidopsis plants** *JOURNAL OF EXPERIMENTAL BOTANY*
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PRESENTATIONS

- Competing paths and interests - mapping steps in sugar translocation in plants. - Department of Plant Sciences, University of California, Davis (April 3, 2015 - April 3, 2015)
- Novel approaches for visualization of transport processes in vivo. - Research Faculty of Agriculture, Hokkaido University (10/6/2014 - 10/6/2014)
- The Yin and Yang of SWEETs. - Cell Molecular Biology, Dept. of Biology, Stanford University (9/14/2014 - 9/15/2014)
- Watching and quantifying biochemical processes in intact plants. - Norwich Research Park/John Innes Centre (March 2014 - March 2014)
- Watching biochemistry live. - Interdisciplinary Plant Group (5/1/2014 - 5/1/2014)
- In vivo biochemistry - fluorescent biosensors for measuring metabolite dynamics and transporter activity. - North Carolina Biotechnology Center/Plant Molecular Biology Consortium (March 2014 - March 2014)
- Quantitative imaging of transport activity and metabolite dynamics with fluorescent biosensors. - CIG seminar, University of Lausanne (September 2013 - September 2013)
- Quantitative imaging of transport activity and metabolite dynamics with fluorescent biosensors. - SFB924 conference (September 2013 - September 2013)
- Identification of a new class of sugar transporters using fluorescent biosensors. - The Garvan Institute of Medical Research (June 2013 - June 2013)
- Novel approaches for visualization of transport processes in vivo. - Plant & Microbial Biology, UC Berkeley (10/1/2013 - 10/1/2013)
- Biosensors for recording transporter and enzyme activities in plants. - The 24th International Conference on Arabidopsis Research (ICAR) (June 2013 - June 2013)
- Filling seeds with sucrose: on the search for the missing transport steps an their regulation. - School of Environmental and Life Sciences, The University of Newcastle (June 2013 - June 2013)
- Sensing transport. - Gordon Research Conference, Mechanisms of Membrane Transport (6/1/2013 - 6/1/2013)
- Optical sensors and in vivo biochemistry. - United Mitochondrial Disease Foundation (UMDF) Symposium (June 2013 - June 2013)
- A multipronged approach for unraveling nutrient uptake and translocation. - International Workshop on Plant Membrane Biology (March 2013 - March 2013)
- A multi-pronged approach to plant nutrition: pico-sensors for transport gene discovery and regulation. - The Huck Institutes for the Life Sciences/ Pennsylvania State University (February 2013 - February 2013)
- A multi-pronged approach to plant nutrition: pico-sensors for transport gene discovery and regulation. - University of Illinois (February 2013 - February 2013)
- In vivo biochemistry with the help of genetically encoded sensors. - Michigan State University (February 2013 - February 2013)

- Novel approaches for visualization of transport processes in vivo. - 38th Naito Conference on “Molecule-based biological systems” (10/7/2014 - 10/9/2014)