

Curriculum Vitae Professor Virginia Walbot

Education

A.B. with Distinction & Honors in Biology, Stanford University, 1967
M. Phil. in Biology, Yale University, 1969
Ph.D. in Biology, Yale University, 1972 Mentor: Ian Sussex
NIH Postdoctoral Fellow, Department of Biochemistry, University of Georgia, 1972-1975
Mentor Leon S. Dure III

Positions Held

Assistant then Associate Professor of Biology, Washington University, St. Louis, Missouri,
1975 - 1980
Adjunct Associate Professor of Agronomy, University of Missouri, Columbia, Missouri, 1979 -
1990
Associate then Full Professor, Department of Biology, Stanford University, 1981 - present
Affiliated Faculty Member, Woods Institute, Stanford 9/1/2009 – 8/31/2011
Honorary Adjunct Staff Scientist at the Carnegie Institution of Science, Department of Plant
Biology, Stanford CA 3/2016 -- present

Cell, Genetics, Science, and Nature

Society Service and Panel Memberships

Member, Committee on Opportunities in Science, American Association for the Advancement
of Science, 1971-1974
Elected, Member-at-large, Board of Trustees, Society for Developmental Biology, 1974-1977
Elected, Board of Directors, Plant Molecular Biology Association, 1980-1983
Elected, Board of Directors, Genetics Society, 1986-1989
Elected, Nominating Committee A.A.A.S. Biological Sciences, 1990-1994; Chair, 1993-1994
Elected, Board of Directors, International Society for Plant Molecular Biology, 1991-1994
Appointed, Committee on Biodiversity, American Institute of Biological Sciences, 1993-1996
Elected, Board of the DNA Methylation Society, 1998-2001
Elected, Maize Genetics Executive Committee, 2000-2003
Elected, Member-at-Large of AAAS Section G, Biological Sciences 2002-2006
Elected, Treasurer, DNA Methylation Society, 2004-2006
Elected, President of Section G, Biological Sciences, of the AAAS 2007
Elected, Maize Genetics Executive Committee, 2007-2012
Appointed as ASPB representative to the Global Plant Council. 2015-2017

Advisory Activities

Member, National Science Foundation Panel on Developmental Biology, 1980-1983
Member, Board on Agriculture, National Research Council, 1982-1987
Member, Panel A Personnel, American Cancer Society, 1983-1988
Ad hoc grant reviewing for the NIH, NSF, DOE, USDA, Marsden Fund, Human Frontiers
Board of Directors, Pioneer Hi-Bred International, Inc. 1985 - 1999

External Examiner, Program in Molecular Biotechnology, Chinese University of Hong Kong
1999-2002

Non-Resident Fellow, Noble Foundation 2000-2005

Consulting for the Rockefeller Foundation and numerous US and international companies in
the area of plant biotechnology

Member of the Research Coordination Network "Deep Gene" 2000-2005

Member, Advisory Board, Maize Genetics Database (MGdB), 2002-2005. Designed and
implemented the new service of reviewing papers by recruiting the first team of writers.

Member, Advisory Board, Plant Sciences Institute, Iowa State University 2002-2009

Recent Activities at Stanford University

Elected, Faculty Senate 2009-2011 and Elected to Steering Committee 2009-2010

Teacher in Science-Math-Engineering core for non-science majors, 1997-1999

Chair of the Committee on Plant Growth Facilities 1995-2013

Chair, Biology Department Undergraduate Studies Committee, 2004 – 2009

Biology Department masters degree committee, 2013-2014 (shared with Hunter Fraser)

Committee on University wide Safety 2012-2015

Committee on University Research 2016-2019

Current teaching

Freshman Seminar Visions of Paradise, a course on garden design

Plant Genetics, graduate and undergraduate course with lab

Advanced Plant Biology seminar every quarter

Teaching and Science Outreach Interests

I teach plant genetics so that it fulfills the Writing in Major requirement for biology majors. There are short weekly writing assignments and midterm and final papers instead of exams. This class is also taken by graduate students interested in genetics or considering a switch to plant biology for their postdoctoral training. I manage the Plant Biology Seminar (fall, winter, spring), and give occasional guest lectures in earth systems and human biology courses on world food issues and GMOs.

I am particularly concerned about scientific literacy, and my freshman seminar on biotechnology involved teaching students how to read and analyze scientific papers and how to debate the societal issues raised by new technologies. I have volunteered to develop new curriculum for non-science students and professional school students at Stanford. This interest started at Washington University where Joe Varner and I taught a very successful course on plants, food, and people that allowed us to introduce students to human nutrition, metabolism, plant genetics, plant structure and fibers, and secondary products as medicines. I have presented many of my current lectures at public forums in which I encourage a discussion of the science underlying transgenic food. Recent lectures have been at the Smithsonian, AAAS meeting, parent orientations at Stanford, and local public services clubs including dahlia societies.

Current Grant Support

NSF Plant Genomics Research Program 17-54097 2018 – 2022 PI Blake Meyers, co-PIs V. Walbot and J. Caplan. The role of non-coding RNA in the modulation of anther and pollen development in grasses.

Patents Issued

United States Patent No. 9,516,824 on December 13, 2016 *Method for Modulating the Number of Archisporial Cells in a Developing Anther*

Publications

Books

- V. Walbot and N. Holder. 1987. **Developmental Biology**. Random House, New York, 751 pages. A college textbook.
- M. Freeling and V. Walbot, editors. 1993. **The Maize Handbook**. Springer-Verlag, New York, 759 pages. A comprehensive guide to genetic, cell biology, developmental, tissue culture, and molecular techniques applied to maize. 1994 paperback edition of the same volume.

Research and Review Articles in the 21st Century

300. Zhan, J., L. O'Connor, D. Marchant, C. Teng, V. Walbot, and Meyers, B. 2022. Coexpression network and trans-activation analyses of maize reproductive phasiRNA loci. **Plant Journal** 113: 160-173. <https://doi.org/10.1111/tpj.16045>
299. Marchant, D. B. and V. Walbot. 2022. Anther development – the long road to making pollen. **Plant Cell** 34: 4677-4695. <https://doi.org/10.1093/plcell/koac287>
298. Marchant, D.B., Nelms, B., and Walbot, V. (2022). FX-Cell: Quantitative cell release from fixed plant tissues for single-cell genomics. **BioRxiv** <https://doi.org/10.1101/2021.10.11.463960>.
297. Zhou, X., K. Huang, C. Teng, A. Abdelgawad, M. Batish, B. C. Meyers, and V. Walbot. 2022. 24-nt phasiRNAs move from tapetal to meiotic cells in maize anthers. **New Phytologist** 235: 488 – 501. <https://doi.org/10.1111/nph.18167>
296. Nan, G-L., C. Teng, J. Fernandes, L. O'Connor, B. C. Meyers, and V. Walbot. 2022. Cascades of bHLH-regulated pathways program maize anther development. **Plant Cell**, 34: 1207-1225. [doi: org/10.1093/plcell/koac007](https://doi.org/10.1093/plcell/koac007)
[Highlight](#) M. Osnato. 2022. Fantastic four: bHLH factors and the making of pollen. **Plant Cell** 34: 1151-1152. <https://doi.org/10.1093/plcell/koac028>
295. Nelms, B. and V. Walbot. 2022. Gametophyte genome activation occurs at pollen mitosis I in maize. **Science** 375: 284-289, plus the cover. [doi: 10.1126/science.aba7392](https://doi.org/10.1126/science.aba7392)

294. Ramsey, J. *et al.* 2021. Crowdsourcing biocuration: the community annotation and ontologies (CACAO). **PLoS Computational Biol.** 17: e1009463. <https://doi.org/10.1371/journal.pcbi.1009463>
293. Ferris, A. C. and V. Walbot. 2021. Understanding *Ustilago maydis* infection of multiple maize organs. **J. Fungi** 7: 8. doi.org/10.3390/jof7010008
292. Zhang, M., X. Ma, C. Wang, Q. Li, B. C. Meyers, N. M Springer, and V. Walbot. 2020. CHH DNA methylation increases at 24-*PHAS* loci depend on 24-nt phasiRNAs in maize meiotic anthers. **New Phytologist** 229: 2984-2997. doi.org/10.1111/nph.17060
291. Yadava, P., S. Tamin, H. Zhang, C. Teng, X. Zhou, B. C. Meyers, and V. Walbot. 2021. Transgenerational conditioned male fertility of HD-ZIP IV transcription factor mutant *ocl4*: impact on 21-phasiRNA accumulation in pre-meiotic maize anthers. **Plant Reproduction** 34: 117-129. [doi 10.1007/s00497-021-00406-3](https://doi.org/10.1007/s00497-021-00406-3)
290. Teng, C., H. Zhang, R. Hammond, K. Huang, B. Meyers, and V. Walbot. 2020. *Dicer-like* 5 deficiency confers temperature-sensitive male sterility in maize. **Nat. Communications** 11, 2912 <https://doi.org/10.1038/s41467-020-16634-6>
289. Nelms, B. and V. Walbot. 2019. Defining the developmental program leading to meiosis in maize. **Science** 364: 52-56. [doi: 10.1126/science.aav6428](https://doi.org/10.1126/science.aav6428)
288. van der Linde, K., and Walbot, V. 2019. *Pre-meiotic anther development*. In **Current Topics in Developmental Biology: Plant Development and Evolution**, U. Grossniklaus, Ed. (San Diego: Academic Press).
287. van der Linde, K., R. L. Egger, L. Timofejeva, and V. Walbot. 2018. Applications of pathogen Trojan horse approach in pre-meiotic maize (*Zea mays*) anther development. **Plant Cell Signaling and Behavior** 13: on line [doi: 10.1080/15592324.2018.1547575](https://doi.org/10.1080/15592324.2018.1547575)
286. Sosso*, D., K. van der Linde*, M. Bezruczyk, D. Schuler, K. Schneider, J. T. Kämper. and V. Walbot. 2018. Sugar partitioning between *Ustilago maydis* and its host *Zea mays* L. during infection. **Plant Physiol.** * co first authors [doi: 10.1104/pp.18.01435](https://doi.org/10.1104/pp.18.01435)
285. Matei, A., C. Ernst, M. Günl, B. Thiele, J. Altmüller, V. Walbot, B. Usadel, and G. Doehlemann. 2018. How to make a tumor: Cell type specific dissection of *Ustilago maydis*-induced tumor development in maize leaves. **New Phytologist** 217: 1681-1695. [doi: 10.1111/nph.14960](https://doi.org/10.1111/nph.14960)
284. van der Linde, K., L. Timofejeva, R. L. Egger, B. Ilau, R. Hammond, C. Teng, B. C. Meyers, G. Doehlemann, and V. Walbot. 2018. Pathogen Trojan horse delivers bioactive host protein to alter maize (*Zea mays*) anther cell behavior in situ. **Plant Cell** 30: 528-542. Breakthrough article. [doi: https://doi.org/10.1105/tpc.17.00238](https://doi.org/10.1105/tpc.17.00238)
- Commentary Farquharson, K. L. 2008. The Trojan horse approach to protein jockeying. **Plant Cell** 30: 517. [doi: https://doi.org/10.1105/tpc.18.00170](https://doi.org/10.1105/tpc.18.00170)

283. Nan, G.-L., J. Zhai, S. Arikrit, D. Morrow, J. Fernandes, L. Mai, N. Nguyen, B. C. Meyers and V. Walbot. 2017. MS23, a master basic helix-loop helix factor, regulates the specification and development of tapetum in maize. **Development** 144: 163-172. doi: [10.1242/dev.140673](https://doi.org/10.1242/dev.140673)
282. Char, S. N., A. K. Anjanasree K. Neelakandan, H. Nahampun, B. Frame, M. Main, M. H. Spalding, P. W. Becraft, B. C. Meyers, V. Walbot, K. Wang, and B. Yang. 2016. An Agrobacterium-delivered CRISPR/Cas9 system for high-frequency targeted mutagenesis in maize. Early view, **Plant Biotechnology J.** 15: 257-268. doi: [10.1111/pbi.12611](https://doi.org/10.1111/pbi.12611)
281. Altpeter, F., N.M. Springer, L. E. Bartley, A. Blechl, T. P. Brutnell, V. Citovsky, L. Conrad, S. B. Gelvin, D. Jackson, A. P. Kausch, P.G. Lemaux, J. I. Medford, M. Orozo-Cardenas, D. Tricoli, J. VanEck, D. F. Voytas, V. Walbot, K. Wang, Z. J. Zhang, and C. Neal Stewart, Jr. 2016. Advancing crop transformation in the era of genome editing. **Plant Cell** 28:1510-1520. <http://dx.doi.org/10.1105/tpc.16.00196>
280. Egger, R. L. and V. Walbot. 2016. A framework for evaluating developmental defects at the cellular level: an example from ten maize anther mutants using morphological and molecular data. **Dev. Biol.** 419: 26-40. doi:[10.1016/j.ydbio.2016.03.016](https://doi.org/10.1016/j.ydbio.2016.03.016)
279. Walbot, V. and R. L. Egger. 2016. Pre-meiotic anther development: Cell fate specification and differentiation. **Annu. Rev. Plant Biol.** 67: 365–395. doi:[10.1146/annurevarplant-043015-111804](https://doi.org/10.1146/annurevarplant-043015-111804)
278. Egger, R. L. and V. Walbot. 2015. Quantifying *Zea mays* tassel development and correlation with anther developmental stages as a guide for experimental studies. **Maydica** 60: M34.
277. Murphy, K. M., R. L. Egger, and V. Walbot. 2015. Chloroplasts in anther endothecium of *Zea mays* (Poaceae). **Am. J. Bot.** 102:1931-1937 doi:[10.3732/ajb.1500384](https://doi.org/10.3732/ajb.1500384)
276. Zhang, H., R. Xia, B. C. Meyers, and V. Walbot. 2015. Evolution, functions and mysteries of plant ARGONAUTE proteins. **Current Opin. Plant Biol.** 27: 84-90. doi: [10.1016/j.pbi.2015.06.011](https://doi.org/10.1016/j.pbi.2015.06.011) Available online 17th July 2015
275. Redkar, A. L. Schilling, R. Hoser, B. Zechmann, M. Krzymowska, V. Walbot, and G. Doehlemann. 2015. A secreted effector protein of *Ustilago maydis* is required to guide host cells to form tumors in maize leaves. **Plant Cell** 27: 1332-1351. doi: <http://dx.doi.org/10.1105/tpc.114.131086>
274. co-first authors [Zhai, J.](#), [H. Zhang](#), S. Arikrit, K. Huang, G. Nan, V. Walbot, and B. Meyers. 2015. Spatiotemporal and cell-type dependent biogenesis of phasi-RNAs during male reproduction in *Zea mays*. **Proc. Natl. Acad. Sci. USA** 112: 3146-3151. doi:[10.1073/pnas.1418918112](https://doi.org/10.1073/pnas.1418918112)
- Commentary M. J. Axtell. 2015. The small mysteries of males. **Nature Plants** 1: 1-2. doi: [10.1038/NPLANTS.2015.55](https://doi.org/10.1038/NPLANTS.2015.55)

273. Lehnert, E. M. and V. Walbot. 2014. Sequencing and de novo assembly of a Dahlia hybrid cultivar transcriptome. **Front. Plant Sci.** 5: 340. doi: [10.3389/fpls.2014.00340](https://doi.org/10.3389/fpls.2014.00340)
272. Kelliher, T., R. Egger, H. Zhang, and V. Walbot. 2014. Unresolved issues in pre-meiotic anther development. **Front. Plant Sci.** 5: Article 347. doi: [10.3389/fpls.2014.00347](https://doi.org/10.3389/fpls.2014.00347)
271. co-first authors Zhang, H., R. Egger, T. Kelliher, D. J. Morrow, J. Fernandes, G-L. Nan, and V. Walbot. 2014. Transcriptomes and proteomes define gene expression progression in pre-meiotic maize anthers. **G3** 4: 994-1010. Special issue on the Genetics of Sex. doi: [10.1534/g3.113.009738](https://doi.org/10.1534/g3.113.009738)
270. Schilling, L., A. Matei, A. Redkar, V. Walbot and G. Doehlemann. 2014. Virulence of the maize smut *Ustilago maydis* is shaped by organ-specific effectors. **Molecular Plant Pathology** 15: 780-789. doi: [10.1111/mpp.12133](https://doi.org/10.1111/mpp.12133)
269. Kelliher, T. and V. Walbot. 2014. Germinal cell initials accommodate hypoxia and precociously express meiotic genes. **Plant J.** 77: 639-652. doi: [10.1111/tpj.12414](https://doi.org/10.1111/tpj.12414)
268. Moon, J., D. Skibbe, L. Timofejeva, C.-J. R. Wang, T. Kelliher, K. Kremling, V. Walbot, and W. Z. Cande. 2013. Regulation of cell divisions and differentiation by MS32 is required for pre-meiotic anther development in *Zea mays*. **Plant J.** 76: 592-602. doi: [10.1111/tpj.12318](https://doi.org/10.1111/tpj.12318)
267. Li, G., T. Kelliher, L. Nguyen, and V. Walbot. 2013. *Ustilago maydis* reprograms cell proliferation in maize anthers. **Plant J.** 75: 903-914. doi: [10.1111/tpj.12270](https://doi.org/10.1111/tpj.12270)
266. Qüesta, J., V. Walbot, and P. Casati. 2013. UV-B radiation induces *Mu* element somatic transposition in maize. **Molecular Plant** 2013; doi: [10.1093/mp/sst112](https://doi.org/10.1093/mp/sst112)
265. Walbot, V. 2013. Domesticating the beast. **BMC Biology** 11: 35 doi: [10.1186/17417007-11-35](https://doi.org/10.1186/17417007-11-35) This is a short commentary following up on issues raised in "Are we training pit bulls to review our manuscripts?" doi:[10.1186/jbiol125](https://doi.org/10.1186/jbiol125) published in 2009. The original commentary is one of most widely viewed articles published in the journal.
264. Walbot, V. 2013. Open questions: Reflections on plant development and genetics. **BMC Biology** 11: 25. doi: [10.1186/1741-7007-11-25](https://doi.org/10.1186/1741-7007-11-25)
263. Marshall, W. F., K. D. Young, M. Swaffer, E. Wood, P. Nurse, A. Kimura, J. Frankel, J. Wallingford, V. Walbot, X. Qu, and A. H. K. Roeder. 2013. Forum: What determines cell size? **BMC Biology** 10:101 doi:[10.1186/1741-7007-10-101](https://doi.org/10.1186/1741-7007-10-101)
262. Wang, D., D. S. Skibbe, and V. Walbot. 2013. *Maize male sterile 8 (ms8)*, a putative beta-1,3-galactosyltransferase, is important for sugar metabolic functions during anther development. **Plant Reproduction** doi: [10.1007/s00497-013-0230-y](https://doi.org/10.1007/s00497-013-0230-y)
261. Timofejeva, L., D. S. Skibbe, S. Lee, I. Golubovskaya, R. Wang, L. Harper, V. Walbot, and W. Z. Cande. 2013. Cytological characterization and allelism testing of pre-meiotic anther developmental mutants identified in a screen of maize male sterile lines. **G3-GENES GENOMES GENETICS** 3: 231-249 doi: [10.1534/g3.112.004465](https://doi.org/10.1534/g3.112.004465)

260. Skibbe, D. S., J. F. Fernandes, and V. Walbot. 2012. *Mu killer*-mediated and spontaneous silencing of *Zea mays* Mutator family transposable elements define distinctive paths of epigenetic inactivation. **Front. Plant Sci.** 3: 212. doi: [10.3389/fpls.2012.00212](https://doi.org/10.3389/fpls.2012.00212)
259. Wang, D., C. M. Adams, J. F. Fernandes, R. L. Egger, and V. Walbot. 2012. A low molecular weight proteome comparison of fertile and *male sterile 8* anthers of *Zea mays*. **Plant Biotechnology J.** 10: 925-935. doi: [10.1111/j.1467-7652.2012.00721.x](https://doi.org/10.1111/j.1467-7652.2012.00721.x)
258. Kelliher, T. and V. Walbot. 2012. Hypoxia triggers meiotic fate acquisition in maize. **Science** 337: 345-348. doi: [10.1126/science.1220080](https://doi.org/10.1126/science.1220080) Our article was featured in PERSPECTIVES **Defining the Plant Germ Line—Nature or Nurture?** C. Whipple *Science* 337 (6092), 301. DOI: [10.1126/science.1224362](https://doi.org/10.1126/science.1224362)
Science Signaling EDITORS' CHOICE **Redox Status Incites Gametogenesis** P. J. Hines *Sci. Signal.* 5 (234), ec197. DOI: [10.1126/scisignal.2003413](https://doi.org/10.1126/scisignal.2003413)
Nature Reviews Genetics RESEARCH HIGHLIGHT **Development: Triggering meiotic fate.** M. Muers. doi:[10.1038/nrg3311](https://doi.org/10.1038/nrg3311)
<http://www.nature.com/nrg/journal/vaop/ncurrent/full/nrg3311.html>
257. Wang, C-J. R., G-L. Nan, T. Kelliher, L. Timofejeva, V. Vernoud, I. N. Golubovskaya, L. Harper, R. L. Egger, V. Walbot, and W. Z. Cande. 2012. Maize *multiple archesporial cell 1 (mac1)*, an ortholog of rice *TDL1A*, modulates cell proliferation and identity in early anther development. **Development** 139: 2594-2603. doi:[10.1242/dev.077891](https://doi.org/10.1242/dev.077891)
256. Walbot, V. 2012. Distinguishing variable phenotypes from variegation caused by transposon activities. In: **Plant Transposable Elements: Methods and Protocols** in the *Methods in Molecular Biology* series T. Peterson (ed). Humana Press Inc., New York. pp.1120.
255. Walbot, V. and J. Qüesta. 2012. Using *MuDR/Mu* transposons in directed tagging strategies. In: **Plant Transposable Elements: Methods and Protocols** in the *Methods in Molecular Biology* series T. Peterson (ed). Humana Press Inc., New York. pp. 143-155.
254. Walbot, V. 2011. How plants cope with temperature stress. **BMC Biology** 9:79 doi:[10.1186/1741-7007-9-79](https://doi.org/10.1186/1741-7007-9-79)
253. Casati, P., D. J. Morrow, J. F. Fernandes, and V. Walbot. 2011. UV-B signaling in maize: Transcriptomic and metabolomic studies at different irradiation times. 2011PSB00399R **Plant Signaling Behavior** 6: <http://www.landesbioscience.com/journals/psb/article/18164/>
252. Nan, G-L., J. Fernandes, R. C. Wang, A. Ronceret, W. Z. Cande, and V. Walbot. 2011. Global transcriptome analysis of two *ameiotic1* alleles in maize anthers: defining steps in meiotic entry and progression through prophase I. **BMC Plant Biology** 11:120. doi:[10.1186/1471-2229-11-120](https://doi.org/10.1186/1471-2229-11-120)
251. Casati, P., D. J. Morrow, J. Fernandes, and V. Walbot. 2011. Rapid maize leaf and immature ear responses to UV-B radiation. **Frontiers in Plant Genetics Genomics** 2:33. doi: [10.3389/fpls.2011.00033](https://doi.org/10.3389/fpls.2011.00033)

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[doi:10.4161/psb.6.8.15751](https://doi.org/10.4161/psb.6.8.15751)

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<http://www.biomedcentral.com/1471-2164/12/321>

248. Wang, DX., D. Skibbe, and V. Walbot. 2011. Maize *csmd1* exhibits pre-meiotic somatic and post-meiotic microspore and somatic defects but sustains anther growth. **Sexual Plant Reproduction** 24: 297-306. doi: 10.1007/s00497-011-0167-y

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[doi:10.1016/j.ydbio.2010.11.005](https://doi.org/10.1016/j.ydbio.2010.11.005)

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PMCID: PMC2974755 doi: 10.1111/j.1365-313X.2010.04294.x

244. Qüesta, J. I. , V. Walbot and P. Casati. 2010. Mutator transposon activation after UV-B involves chromatin remodeling and DNA demethylation. **Epigenetics** 5: 352-363. doi: 10.4161/epi.5.4.11751

243. Skibbe, D. S., G. Doehlemann, J. Fernandes and V. Walbot. 2010. Maize tumor formation after *Ustilago maydis* infection requires organ-specific gene expression by both partners. **Science** 328: 89 – 92. doi: 10.1126/science.1185775

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[doi:10.1371/journal.pgen.1000723](https://doi.org/10.1371/journal.pgen.1000723) Editorial

240. Soderlund, C., A. Descour, D. Kudrna, M. Bomhoff, L. Boyd, J. Currie, A. Angelova, K. Collura, M. Wissotski, E. Ashley, D. Morrow, J. Fernandes, V. Walbot, and Y. Yu. 2009. Sequencing, mapping and analysis of 27,455 maize full-length cDNAs. **PLoS Genetics** 5: e1000740. doi:10.1371/journal.pgen.1000740

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