

# DANIEL F. VOYTAS

## *Curriculum Vitae*

Department of Genetics, Cell Biology & Development  
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### EDUCATION

<i>Institution</i>	<i>Mentor</i>	<i>Degree</i>	<i>Year</i>	<i>Major</i>
Harvard University		A.B.	1984	Biology
Harvard Medical School	F. Ausbel	Ph.D.	1990	Genetics
Johns Hopkins University	J. Boeke	Postdoctoral Associate	1991-92	Molecular Genetics

### EMPLOYMENT EXPERIENCE

<i>Year</i>	<i>Title</i>	<i>Affiliation</i>
2008 – Present	Professor	University of Minnesota
2001 – 2007	Professor	Iowa State University
1997 – 2001	Associate Professor	Iowa State University
1992 – 1997	Assistant Professor	Iowa State University

### SELECT HONORS, AFFILIATIONS AND SERVICE

2020 – present	Scientific Advisory Board Member, NSF Biological Integration Institute
2020 – present	Editorial Board, <i>Gene and Genome Editing</i>
2020 – present	Innovative Genomics Institute, Scientific Advisory Board
2018 – present	Institute Fellow, Galton Institute, United Kingdom
2018 – present	Director, Center for Precision Plant Genomics, University of Minnesota
2017 – present	Distinguished McKnight Presidential Endowed Professorship
2016 – present	Director, Hackett Fund for Genome Engineering
2020 – 2022	Science Advisory Board, Chair. Calyxt, St. Paul, Minnesota
2020	Presidential Award of the Crop Science Society of America
2018 – 2022	Adjunct Professor, Northwest A&F University, Shaanxi, China
2019	Elected to Membership in the National Academy of Sciences
2015 – 2019	Guest Editor, <i>The Plant Cell</i>
2014	Entrepreneurial Researcher Innovation Award, University of Minnesota
2010 – 2020	Chief Science Officer, Calyxt, St. Paul, Minnesota
2009 – 2013	Senior Editor, <i>Mobile DNA</i>
2008 – 2017	Director, Center for Genome Engineering, University of Minnesota
2007	Elected Fellow, American Association for the Advancement of Science
2003 – 2015	Associate Editor, <i>Genetics</i>
2004	Excellence in Research, College of Agriculture, Iowa State University
2000 – 2005	CEO and founder of Phytodyne, Inc., Ames, Iowa
1997	Professor of the Year, VEISHEA '97, Iowa State University
1994 – 1997	American Cancer Society Junior Faculty Research Award
1991 - 1992	Genentech Fellow of the Life Sciences Research Foundation
1984	Phi Beta Kappa, Summa cum laude in Biology, Harvard College

## PUBLICATIONS – 179 TOTAL

### PEER REVIEWED RESEARCH ARTICLES – REVERSE CHRONOLOGICAL ORDER; 140 TOTAL

1. Nagalakshmi, U., Meier, N., Liu, J.-Y., Voytas, D. F. & Dinesh-Kumar, S. P. High-efficiency multiplex biallelic heritable editing in Arabidopsis using an RNA virus. *Plant Physiol* **189**, 1241–1245 (2022).
2. Liu, D., Xuan, S., Prichard, L. E., Donahue, L. I., Pan, C., Nagalakshmi, U., Ellison, E. E., Starker, C. G., Dinesh-Kumar, S. P., Qi, Y. & Voytas, D. F. Heritable base-editing in Arabidopsis using RNA viral vectors. *Plant Physiol* **189**, 1920–1924 (2022).
3. Cody, J. P., Maher, M. F., Nasti, R. A., Starker, C. G., Chamness, J. C. & Voytas, D. F. Direct delivery and fast-treated Agrobacterium co-culture (Fast-TrACC) plant transformation methods for *Nicotiana benthamiana*. *Nat Protoc* (2022).
4. Atkins, P. A. P., Gamo, M. E. S. & Voytas, D. F. Analyzing Plant Gene Targeting Outcomes and Conversion Tracts with Nanopore Sequencing. *International Journal of Molecular Sciences* **22**, (2021).
5. Khakhar, A. *et al.* VipariNama: RNA viral vectors to rapidly elucidate the relationship between gene expression and phenotype. *Plant Physiol* **186**, 2222–2238 (2021).
6. Nasti, R. A., Zinselmeier, M. H., Vollbrecht, M., Maher, M. F., Voytas, D. F. Fast-TrACC: A rapid method for delivering and testing gene editing reagents in somatic plant cells. *Frontiers in Genome Editing* **2**, 32 (2021).
7. Nasti, R. A. & Voytas, D. F. Attaining the promise of plant gene editing at scale. *Proc Natl Acad Sci USA* **118**, e2004846117 (2021).
8. T. Weiss, C. Wang, X. Kang, H. Zhao, M. Elena Gamo, C. G. Starker, P. A. Crisp, P. Zhou, N. M. Springer, D. F. Voytas, F. Zhang, Optimization of multiplexed CRISPR/Cas9 system for highly efficient genome editing in *Setaria viridis*. *Plant J.* **104**, 828–838 (2020).
9. M. F. Maher, R. A. Nasti, M. Vollbrecht, C. G. Starker, M. D. Clark, D. F. Voytas, Plant gene editing through *de novo* induction of meristems. *Nat Biotechnol.* **38**, 84–89 (2020).
10. A. Khakhar, C. G. Starker, J. C. Chamness, N. Lee, S. Stokke, C. Wang, R. Swanson, F. Rizvi, T. Imaizumi, D. F. Voytas, Building customizable auto-luminescent luciferase-based reporters in plants. *Elife.* **9** (2020), doi:10.7554/eLife.52786.
11. E. E. Ellison, U. Nagalakshmi, M. E. Gamo, P.-J. Huang, S. Dinesh-Kumar, D. F. Voytas, Multiplexed heritable gene editing using RNA viruses and mobile single guide RNAs. *Nat Plants.* **6**, 620–624 (2020).
12. S. S. Nadakuduti, C. G. Starker, D. K. Ko, T. B. Jayakody, C. R. Buell, D. F. Voytas, D. S. Douches, Evaluation of methods to assess *in vivo* activity of engineered genome-editing nucleases in protoplasts. *Front Plant Sci.* **10**, 110 (2019).
13. Y. Mei, B. M. Beernink, E. E. Ellison, E. Konečná, A. K. Neelakandan, D. F. Voytas, S. A. Whitham, Protein expression and gene editing in monocots using foxtail mosaic virus vectors. *Plant Direct.* **3**, e00181 (2019).
14. A. Zsögön, T. Čermák, E. R. Naves, M. M. Notini, K. H. Edel, S. Weigl, L. Freschi, D. F. Voytas, J. Kudla, L. E. P. Peres, *De novo* domestication of wild tomato using genome editing. *Nat Biotechnol* (2018), doi:10.1038/nbt.4272.
15. Q. Shan, N. J. Baltes, P. Atkins, E. R. Kirkland, Y. Zhang, J. A. Baller, L. G. Lowder, A. A. Malzahn, J. C. 3rd Haugner, B. Seelig, D. F. Voytas, Y. Qi, ZFN, TALEN and CRISPR-Cas9 mediated homology directed gene insertion in Arabidopsis: A disconnect between somatic and germinal cells. *J Genet Genomics.* **45**, 681–684 (2018).
16. S. Sánchez-León, J. Gil-Humanes, C. V. Ozuna, M. J. Giménez, C. Sousa, D. F. Voytas, F. Barro, Low-gluten, nontransgenic wheat engineered with CRISPR/Cas9. *Plant Biotechnol J.* **16**, 902–910 (2018).
17. X. Patrinostró, P. Roy, A. Lindsay, C. M. Chamberlain, L. J. Sundby, C. G. Starker, D. F. Voytas, J. M. Ervasti, B. J. Perrin, Essential nucleotide- and protein-dependent functions of Actb/ $\beta$ -actin. *Proc Natl Acad Sci U S A.* **115**, 7973–7978 (2018).

18. S. S. Nadakuduti, C. R. Buell, D. F. Voytas, C. G. Starker, D. S. Douches, Genome editing for crop improvement - applications in clonally propagated polyploids with a focus on potato (*Solanum tuberosum* L.). *Front Plant Sci.* **9**, 1607 (2018).
19. A. Macovei, N. R. Sevilla, C. Cantos, G. B. Jonson, I. Slamet-Loedin, T. Čermák, D. F. Voytas, I.-R. Choi, P. Chadha-Mohanty, Novel alleles of rice eIF4G generated by CRISPR/Cas9-targeted mutagenesis confer resistance to Rice tungro spherical virus. *Plant Biotechnol J.* **16**, 1918–1927 (2018).
20. L. G. Lowder, J. Zhou, Y. Zhang, A. Malzahn, Z. Zhong, T.-F. Hsieh, D. F. Voytas, Y. Zhang, Y. Qi, Robust transcriptional activation in plants using multiplexed CRISPR-Act2.0 and mTALE-Act Systems. *Mol Plant.* **11**, 245–256 (2018).
21. A. W. Hummel, R. D. Chauhan, T. Cermak, A. M. Mutka, A. Vijayaraghavan, A. Boyher, C. G. Starker, R. Bart, D. F. Voytas, N. J. Taylor, Allele exchange at the EPSPS locus confers glyphosate tolerance in cassava. *Plant Biotechnol J.* **16**, 1275–1282 (2018).
22. J. He, M. Xu, M. R. Willmann, K. McCormick, T. Hu, L. Yang, C. G. Starker, D. F. Voytas, B. C. Meyers, R. S. Poethig, Threshold-dependent repression of SPL gene expression by miR156/miR157 controls vegetative phase change in *Arabidopsis thaliana*. *PLoS Genet.* **14**, e1007337 (2018).
23. S. J. Curtin, Y. Xiong, J.-M. Michno, B. W. Campbell, A. O. Stec, T. Čermák, C. Starker, D. F. Voytas, A. L. Eamens, R. M. Stupar, CRISPR/Cas9 and TALENs generate heritable mutations for genes involved in small RNA processing of *Glycine max* and *Medicago truncatula*. *Plant Biotechnol J.* **16**, 1125–1137 (2018).
24. P. Bhowmik, E. Ellison, B. Polley, V. Bollina, M. Kulkarni, K. Ghanbarnia, H. Song, C. Gao, D. F. Voytas, S. Kagale, Targeted mutagenesis in wheat microspores using CRISPR/Cas9. *Sci Rep.* **8**, 6502 (2018).
25. M. C. Wilson, A. M. Mutka, A. W. Hummel, J. Berry, R. D. Chauhan, A. Vijayaraghavan, N. J. Taylor, D. F. Voytas, D. H. Chitwood, R. S. Bart, Gene expression atlas for the food security crop cassava. *New Phytol.* **213**, 1632–1641 (2017).
26. J. L. Van Etten, M. Nyquist, Y. Li, R. Yang, Y. Ho, R. Johnson, O. Ondigi, D. F. Voytas, C. Henzler, S. M. Dehm, Targeting a single alternative polyadenylation site coordinately blocks expression of androgen receptor mRNA splice variants in prostate cancer. *Cancer Res.* **77**, 5228–5235 (2017).
27. X. Tang, L. G. Lowder, T. Zhang, A. A. Malzahn, X. Zheng, D. F. Voytas, Z. Zhong, Y. Chen, Q. Ren, Q. Li, E. R. Kirkland, Y. Zhang, Y. Qi, A CRISPR-Cpf1 system for efficient genome editing and transcriptional repression in plants. *Nat Plants.* **3**, 17018 (2017).
28. F. Liška, V. Landa, V. Zidek, P. Mlejnek, J. Šilhavý, M. Šimáková, H. Strnad, J. Trnovská, V. Škop, L. Kazdová, C. G. Starker, D. F. Voytas, Z. Izsvák, M. Mancini, O. Šeda, V. Křen, M. Pravenec, Downregulation of *Plzf* gene ameliorates metabolic and cardiac traits in the spontaneously hypertensive rat. *Hypertension.* **69**, 1084–1091 (2017).
29. I. B. Holme, T. Wendt, J. Gil-Humanes, L. C. Deleuran, C. G. Starker, D. F. Voytas, H. Brinch-Pedersen, Evaluation of the mature grain phytase candidate HvPAPhy a gene in barley (*Hordeum vulgare* L.) using CRISPR/Cas9 and TALENs. *Plant Mol Biol.* **95**, 111–121 (2017).
30. J. Gil-Humanes, Y. Wang, Z. Liang, Q. Shan, C. V. Ozuna, S. Sánchez-León, N. J. Baltes, C. Starker, F. Barro, C. Gao, D. F. Voytas, High-efficiency gene targeting in hexaploid wheat using DNA replicons and CRISPR/Cas9. *Plant J.* **89**, 1251–1262 (2017).
31. S. J. Curtin, P. Tiffin, J. Guhlin, D. I. Trujillo, L. T. Burghart, P. Atkins, N. J. Baltes, R. Denny, D. F. Voytas, R. M. Stupar, N. D. Young, Validating genome-wide association candidates controlling quantitative variation in nodulation. *Plant Physiol.* **173**, 921–931 (2017).
32. T. Čermák, S. J. Curtin, J. Gil-Humanes, R. Čegan, T. J. Y. Kono, E. Konečná, J. J. Belanto, C. G. Starker, J. W. Mathre, R. L. Greenstein, D. F. Voytas, A multipurpose toolkit to enable advanced genome engineering in plants. *Plant Cell.* **29**, 1196–1217 (2017).

33. O. O. Abudayyeh, J. S. Gootenberg, P. Essletzbichler, S. Han, J. Joung, J. J. Belanto, V. Verdine, D. B. T. Cox, M. J. Kellner, A. Regev, E. S. Lander, D. F. Voytas, A. Y. Ting, F. Zhang, RNA targeting with CRISPR-Cas13. *Nature*. **550**, 280–284 (2017).
34. C. Vives, F. Charlot, C. Mhiri, B. Contreras, J. Daniel, A. Epert, D. F. Voytas, M.-A. Grandbastien, F. Nogu , J. M. Casacuberta, Highly efficient gene tagging in the bryophyte *Physcomitrella patens* using the tobacco (*Nicotiana tabacum*) Tnt1 retrotransposon. *New Phytol.* **212**, 759–769 (2016).
35. X. Tang, X. Zheng, Y. Qi, D. Zhang, Y. Cheng, A. Tang, D. F. Voytas, Y. Zhang, A single transcript CRISPR-Cas9 system for efficient genome editing in plants. *Mol Plant.* **9**, 1088–1091 (2016).
36. T. J. Stoddard, B. M. Clasen, N. J. Baltes, Z. L. Demorest, D. F. Voytas, F. Zhang, S. Luo, Targeted mutagenesis in plant cells through transformation of sequence-specific nuclease mRNA. *PLoS One*. **11**, e0154634 (2016).
37. Y. Qi, Y. Zhang, J. A. Baller, D. F. Voytas, Histone H2AX and the small RNA pathway modulate both non-homologous end-joining and homologous recombination in plants. *Mutat Res.* **783**, 9–14 (2016).
38. M. J. Osborn, B. R. Webber, F. Knipping, C. Lonetree, N. Tennis, A. P. DeFeo, A. N. McElroy, C. G. Starker, C. Lee, S. Merkel, T. C. Lund, K. S. Kelly-Spratt, M. C. Jensen, D. F. Voytas, C. von Kalle, M. Schmidt, R. Gabriel, K. L. Hippen, J. S. Miller, A. M. Scharenberg, J. Tolar, B. R. Blazar, Evaluation of TCR gene editing achieved by TALENs, CRISPR/Cas9, and megaTAL nucleases. *Mol Ther.* **24**, 570–581 (2016).
39. A. Nishizawa-Yokoi, T. Cermak, T. Hoshino, K. Sugimoto, H. Saika, A. Mori, K. Osakabe, M. Hamada, Y. Katayose, C. Starker, D. F. Voytas, S. Toki, A defect in DNA ligase4 enhances the frequency of TALEN-mediated targeted mutagenesis in rice. *Plant Physiol.* **170**, 653–666 (2016).
40. F. Liška, R. Peterková, M. Peterka, V. Landa, V. Zídek, P. Mlejnek, J. Šilhavý, M. Šimáková, V. Křen, C. G. Starker, D. F. Voytas, Z. Izsvák, M. Pravenec, Targeting of the *Plzf* gene in the rat by transcription activator-like effector nuclease results in caudal regression syndrome in spontaneously hypertensive rats. *PLoS One*. **11**, e0164206 (2016).
41. J. Li, T. J. Stoddard, Z. L. Demorest, P.-O. Lavoie, S. Luo, B. M. Clasen, F. Cedrone, E. E. Ray, A. P. Coffman, A. Daulhac, A. Yabandith, A. J. Retterath, L. Mathis, D. F. Voytas, M.-A. D’Aoust, F. Zhang, Multiplexed, targeted gene editing in *Nicotiana benthamiana* for glyco-engineering and monoclonal antibody production. *Plant Biotechnol J.* **14**, 533–542 (2016).
42. Z. Gan, L. Ding, C. J. Burckhardt, J. Lowery, A. Zaritsky, K. Sitterley, A. Mota, N. Costigliola, C. G. Starker, D. F. Voytas, J. Tytell, R. D. Goldman, G. Danuser, Vimentin intermediate filaments template microtubule networks to enhance persistence in cell polarity and directed migration. *Cell Syst.* **3**, 252-263.e8 (2016).
43. Z. L. Demorest, A. Coffman, N. J. Baltes, T. J. Stoddard, B. M. Clasen, S. Luo, A. Retterath, A. Yabandith, M. E. Gamo, J. Bissen, L. Mathis, D. F. Voytas, F. Zhang, Direct stacking of sequence-specific nuclease-induced mutations to produce high oleic and low linolenic soybean oil. *BMC Plant Biol.* **16**, 225 (2016).
44. B. M. Clasen, T. J. Stoddard, S. Luo, Z. L. Demorest, J. Li, F. Cedrone, R. Tibebu, S. Davison, E. E. Ray, A. Daulhac, A. Coffman, A. Yabandith, A. Retterath, W. Haun, N. J. Baltes, L. Mathis, D. F. Voytas, F. Zhang, Improving cold storage and processing traits in potato through targeted gene knockout. *Plant Biotechnol J.* **14**, 169–176 (2016).
45. N. M. Butler, N. J. Baltes, D. F. Voytas, D. S. Douches, Geminivirus-mediated genome editing in potato (*Solanum tuberosum* L.) using sequence-specific nucleases. *Front Plant Sci.* **7**, 1045 (2016).
46. M. J. Osborn, R. Gabriel, B. R. Webber, A. P. DeFeo, A. N. McElroy, J. Jarjour, C. G. Starker, J. E. Wagner, J. K. Joung, D. F. Voytas, C. von Kalle, M. Schmidt, B. R. Blazar, J. Tolar, Fanconi anemia gene editing by the CRISPR/Cas9 system. *Hum Gene Ther.* **26**, 114–126 (2015).
47. S. Luo, J. Li, T. J. Stoddard, N. J. Baltes, Z. L. Demorest, B. M. Clasen, A. Coffman, A. Retterath, L. Mathis, D. F. Voytas, F. Zhang, Non-transgenic plant genome editing using purified sequence-specific nucleases. *Mol Plant.* **8**, 1425–1427 (2015).

48. L. G. Lowder, D. Zhang, N. J. Baltes, J. W. 3rd Paul, X. Tang, X. Zheng, D. F. Voytas, T.-F. Hsieh, Y. Zhang, Y. Qi, A CRISPR/Cas9 toolbox for multiplexed plant genome editing and transcriptional regulation. *Plant Physiol.* **169**, 971–985 (2015).
49. S. J. Curtin, J.-M. Michno, B. W. Campbell, J. Gil-Humanes, S. M. Mathioni, R. Hammond, J. J. Gutierrez-Gonzalez, R. C. Donohue, M. B. Kantar, A. L. Eamens, B. C. Meyers, D. F. Voytas, R. M. Stupar, MicroRNA maturation and microRNA target gene expression regulation are severely disrupted in soybean dicer-like1 double mutants. *G3 (Bethesda)*. **6**, 423–433 (2015).
50. T. Čermák, N. J. Baltes, R. Čegan, Y. Zhang, D. F. Voytas, High-frequency, precise modification of the tomato genome. *Genome Biol.* **16**, 232 (2015).
51. N. M. Butler, P. A. Atkins, D. F. Voytas, D. S. Douches, Generation and inheritance of targeted mutations in potato (*Solanum tuberosum* L.) using the CRISPR/Cas system. *PLoS One*. **10**, e0144591 (2015).
52. A. Bridier-Nahmias, A. Tchalikian-Cosson, J. A. Baller, R. Menouni, H. Fayol, A. Flores, A. Saïb, M. Werner, D. F. Voytas, P. Lesage, Retrotransposons. An RNA polymerase III subunit determines sites of retrotransposon integration. *Science*. **348**, 585–588 (2015).
53. Z. Ali, A. Abul-faraj, L. Li, N. Ghosh, M. Piatek, A. Mahjoub, M. Aouida, A. Piatek, N. J. Baltes, D. F. Voytas, S. Dinesh-Kumar, M. M. Mahfouz, Efficient virus-mediated genome editing in plants using the CRISPR/Cas9 system. *Mol Plant*. **8**, 1288–1291 (2015).
54. V. S. Lor, C. G. Starker, D. F. Voytas, D. Weiss, N. E. Olszewski, Targeted mutagenesis of the tomato *PROCERA* gene using transcription activator-like effector nucleases. *Plant Physiol.* **166**, 1288–1291 (2014).
55. W. Haun, A. Coffman, B. M. Clasen, Z. L. Demorest, A. Lowy, E. Ray, A. Retterath, T. Stoddard, A. Juillerat, F. Cedrone, L. Mathis, D. F. Voytas, F. Zhang, Improved soybean oil quality by targeted mutagenesis of the *fatty acid desaturase 2* gene family. *Plant Biotechnol J.* **12**, 934–940 (2014).
56. F. Daboussi, S. Leduc, A. Maréchal, G. Dubois, V. Guyot, C. Perez-Michaut, A. Amato, A. Falcitore, A. Juillerat, M. Beurdeley, D. F. Voytas, L. Cavarec, P. Duchateau, Genome engineering empowers the diatom *Phaeodactylum tricorutum* for biotechnology. *Nat Commun.* **5**, 3831 (2014).
57. N. J. Baltes, J. Gil-Humanes, T. Cermak, P. A. Atkins, D. F. Voytas, DNA replicons for plant genome engineering. *Plant Cell*. **26**, 151–163 (2014).
58. Y. Zhang, F. Zhang, X. Li, J. A. Baller, Y. Qi, C. G. Starker, A. J. Bogdanove, D. F. Voytas, Transcription activator-like effector nucleases enable efficient plant genome engineering. *Plant Physiol.* **161**, 20–27 (2013).
59. T. Wendt, P. B. Holm, C. G. Starker, M. Christian, D. F. Voytas, H. Brinch-Pedersen, I. B. Holme, TAL effector nucleases induce mutations at a pre-selected location in the genome of primary barley transformants. *Plant Mol Biol.* **83**, 279–285 (2013).
60. H. Wang, Y.-C. Hu, S. Markoulaki, G. G. Welstead, A. W. Cheng, C. S. Shivalila, T. Pyntikova, D. B. Dadon, D. F. Voytas, A. J. Bogdanove, D. C. Page, R. Jaenisch, TALEN-mediated editing of the mouse Y chromosome. *Nat Biotechnol.* **31**, 530–532 (2013).
61. Q. Shan, Y. Wang, K. Chen, Z. Liang, J. Li, Y. Zhang, K. Zhang, J. Liu, D. F. Voytas, X. Zheng, Y. Zhang, C. Gao, Rapid and efficient gene modification in rice and *Brachypodium* using TALENs. *Mol Plant*. **6**, 1365–1368 (2013).
62. Y. Qi, Y. Zhang, F. Zhang, J. A. Baller, S. C. Cleland, Y. Ryu, C. G. Starker, D. F. Voytas, Increasing frequencies of site-specific mutagenesis and gene targeting in *Arabidopsis* by manipulating DNA repair pathways. *Genome Res.* **23**, 547–554 (2013).
63. Y. Qi, X. Li, Y. Zhang, C. G. Starker, N. J. Baltes, F. Zhang, J. D. Sander, D. Reyon, J. K. Joung, D. F. Voytas, Targeted deletion and inversion of tandemly arrayed genes in *Arabidopsis thaliana* using zinc finger nucleases. *G3 (Bethesda)*. **3**, 1707–1715 (2013).
64. M. J. Osborn, C. G. Starker, A. N. McElroy, B. R. Webber, M. J. Riddle, L. Xia, A. P. DeFeo, R. Gabriel, M. Schmidt, C. von Kalle, D. F. Carlson, M. L. Maeder, J. K. Joung, J. E. Wagner, D. F. Voytas, B. R. Blazar, J. Tolar, TALEN-based gene correction for epidermolysis bullosa. *Mol Ther.* **21**, 1151–1159 (2013).

65. M. D. Nyquist, Y. Li, T. H. Hwang, L. S. Manlove, R. L. Vessella, K. A. T. Silverstein, D. F. Voytas, S. M. Dehm, TALEN-engineered AR gene rearrangements reveal endocrine uncoupling of androgen receptor in prostate cancer. *Proc Natl Acad Sci U S A*. **110**, 17492–17497 (2013).
66. F. Fu, D. F. Voytas, Zinc Finger Database (ZiFDB) v2.0: a comprehensive database of C<sub>2</sub>H<sub>2</sub> zinc fingers and engineered zinc finger arrays. *Nucleic Acids Res*. **41**, D452-455 (2013).
67. E. L. Doyle, A. W. Hummel, Z. L. Demorest, C. G. Starker, D. F. Voytas, P. Bradley, A. J. Bogdanove, TAL effector specificity for base 0 of the DNA target is altered in a complex, effector- and assay-dependent manner by substitutions for the tryptophan in cryptic repeat -1. *PLoS One*. **8**, e82120 (2013).
68. M. Christian, Y. Qi, Y. Zhang, D. F. Voytas, Targeted mutagenesis of *Arabidopsis thaliana* using engineered TAL effector nucleases. *G3 (Bethesda)*. **3**, 1697–1705 (2013).
69. M. Beurdeley, F. Bietz, J. Li, S. Thomas, T. Stoddard, A. Juillerat, F. Zhang, D. F. Voytas, P. Duchateau, G. H. Silva, Compact designer TALENs for efficient genome engineering. *Nat Commun*. **4**, 1762 (2013).
70. K. J. Beumer, J. K. Trautman, M. Christian, T. J. Dahlem, C. M. Lake, R. S. Hawley, D. J. Grunwald, D. F. Voytas, D. Carroll, Comparing zinc finger nucleases and transcription activator-like effector nucleases for gene targeting in *Drosophila*. *G3 (Bethesda)*. **3**, 1717–1725 (2013).
71. E. L. Doyle, N. J. Booher, D. S. Standage, D. F. Voytas, V. P. Brendel, J. K. Vandyk, A. J. Bogdanove, TAL Effector-Nucleotide Targeter (TALE-NT) 2.0: tools for TAL effector design and target prediction. *Nucleic Acids Res*. **40**, W117-122 (2012).
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## **PATENTS ISSUED**

- Michelle L Christian; Daniel F Voytas; Feng Zhang; Tomas Cermak; Adam J. Bogdanove; Li Wang; Clarice L. Schmidt; Erin L. Doyle – August 15, 2018. *TAL Effector-mediated DNA Modification*. EU Patent No. 2816112. Countries: Austria, Belgium, Bulgaria, Switzerland, Czech Republic, Germany, Denmark, Europe, Spain, France, United Kingdom, Hungary, Ireland, Italy, Netherlands, Norway, Poland, Portugal, Romania, Sweden, Turkey
- Voytas, Daniel F., Bogdanove, Adam J., Zhang, F. – September 12, 2017. *TAL Effector-Mediated DNA Modification*. US Patent No. 9/758,775 B2
- Osborn, Mark J., Tolar, Jakub, Blazar, Bruce, Voytas, Daniel F. – July 19, 2016. *Talen-based Gene Correction*. US Patent No. 9/393,257
- Osborn, Mark J., Tolar, Jakub, Blazar, Bruce, Voytas, Daniel F. – July 19, 2016. *Talen-based Gene Correction*. US Patent No. 9/393,257
- Voytas, Daniel F, Zhang, Feng, and Bogdanove, Adam – April 15, 2014. *TAL effector-mediated DNA modification*. US Patent No. 8/697,853
- Voytas, Daniel F, Zhang, Feng, and Bogdanove, Adam – November 19, 2013. *TAL effector-mediated DNA modification*. US Patent No. 8/586,363
- Voytas, Daniel F, Zhang, Feng, and Bogdanove, Adam – May 28, 2013. *TAL effector-mediated DNA modification*. US Patent No. 8/450,471
- Voytas, Daniel F, Zhang, Feng, and Bogdanove, Adam – May 14, 2013. *TAL effector-mediated DNA modification*. US Patent No. 8/440,431
- Voytas, Daniel F, Zhang, Feng, and Bogdanove, Adam – May 14, 2013. *TAL effector-mediated DNA modification*. US Patent No. 8/440,432

## **PATENTS PENDING**

- Gene Targeting in Plants Using DNA Viruses*. EP Application No, 13807501.5
- Voytas, Daniel F, Bogdanove, Adam, Zhang, Feng – October 5, 2017. *TAL effector-mediated DNA modification*. US Patent Application No: 15/725,980
- Hummel, Aaron W., Gil, Javier, Voytas, Daniel F. – December 14, 2016. *Methods for Using a 5'-Exonuclease to Increase Homologous Recombination in Eukaryotic Cells*. US Patent Application No: 15/378,609
- Abudayyeh, Omar, Belanto, Joseph J., Gootenberg, Jonathan, Starker, Colby G., Voytas, Daniel F., Zhang, Feng. – December 9, 2016. *CRISPR-Systems for Modifying a Trait of Interest in a Plant*. US Patent Application No: 62/432,543
- Gil, Javier, Baltes, Nicholas J., Voytas, Daniel F. – October 24, 2016. *Multiplex Gene Targeting in Plants*. US Patent Application No: 62/411,952
- Hummel, Aaron, Voytas, Daniel F, Bart, Rebecca, Taylor, Nigel – January 12, 2016. *Glyphosate Tolerant Plants Having Modified 5-Enolpyruvylshikimate-3-Phosphate Synthase Gene Regulation*. US Patent Application No. 62/277,734
- Voytas, Daniel F, Blazar, Bruce, Osborn, Mark and Tolar, Jakub – May 20, 2015. *Method for Editing a Genetic Sequence*. US Patent Application No. 15/311,685
- Baltes, Nicholas, Atkins, Paul, Voytas, Daniel F. – February 24, 2015. *Engineering Plant Genomes Using CRISPR/Cas Systems*. US Patent Application No. 14/629,859
- Perlingeiro, Rita, Kyba, Michael, Rinaldi, Fabrizio, Voytas, Daniel F. – November 4, 2014. *Gene Targeting Methods and Tools*. US Patent Application No. 14/532,684
- Baltes, Nicholas, and Voytas, Daniel F. – September 30, 2014. *Conferring resistance to geminiviruses in plants using CRISPR/Cas Systems*. US Patent Application No. 15/025,690
- Baltes, Nicholas, and Voytas, Daniel F – June 19, 2013. *Gene targeting in plants using DNA viruses*. US Patent Application No. 14/409,148

## RESEARCH FUNDING

### CURRENT EXTRAMURAL SUPPORT

**Project Title:** *Integrated engineering of whole plant water use efficiency in Sorghum and Setaria*

Source of Support: US Department of Energy: DE-SC0023160

Total Award Amount: \$1,266,116

Total Award Period Covered: 09/2022 – 08/2027

Location of Project: Donald Danforth Plant Science Center

Person-Months Per Year Committed to the Project: 0.1

**Project Title:** *Center for Advanced Bioenergy and Bioproduct Innovation*

Source of Support: US Department of Energy: DE-SC0018420

Total Award Amount: \$228,345

Total Award Period Covered: 12/2022 – 11/2027

Location of Project: University of Illinois at Urbana-Champaign

Person-Months Per Year Committed to the Project: 1

**Project Title:** *High throughput mutagenesis in plants through viral infection*

Source of Support: Google Inc.

Total Award Amount: \$180,000

Total Award Period Covered: 12/2019 – 12/2023

Location of Project: University of Minnesota

Person-Months Per Year Committed to the Project: 0.12

**Project Title:** *Plant Engineering Technologies*

Source of Support: USDOD Defense Advanced Research Projects

Total Award Amount: \$2,019,695

Total Award Period Covered: 07/2021 – 06/2025

Location of Project: John Hopkins University

Person-Months Per Year Committed to the Project: 2

**Project Title:** *PlantSynBio: Chassis design for sustainable production of high value terpenoids in the crop species tomato*

Source of Support: NSF 2126592

Total Award Amount: \$503,091

Total Award Period Covered: 10/2021 – 09/2024

Location of Project: University of Georgia

Person-Months Per Year Committed to the Project: 0.5

**Project Title:** *Applications of Advanced Phenotyping and Genome Editing to Accelerate Genetic Gains in Tef Breeding in Ethiopia*

Source of Support: Corteva Agriscience

Total Award Amount: \$ 43,182

Total Award Period Covered: 10/2022 – 09/2023

Location of Project: Donald Danforth Plant Science Center

Person-Months Per Year Committed to the Project: 0.12

## RESEARCH SUPERVISION

### GRADUATE STUDENTS TRAINED:

Matt Zinselmeier, 05/22 Ph.D. in Molecular Cellular & Developmental Biology

Evan Ellison, 12/21 Ph.D. in Plant & Microbial Biology

Michael Maher, 04/21 Ph.D. Plant & Microbial Biology  
 Maria Elena Gamo, 01/21 MBS in Molecular Cellular & Developmental Biology  
 Ryan Nasti, 12/20. Ph.D. in Molecular Cellular & Developmental Biology  
 Paul Atkins, 8/20. Ph.D. in Molecular Cellular & Developmental Biology  
 Nick Baltes, 8/14. Ph.D. in Molecular Cellular & Developmental Biology  
 Mick Nyquist, 5/14. Ph.D. in Molecular Cellular & Developmental Biology  
 Michelle Christian, 8/13, Ph.D. in Molecular Cellular & Developmental Biology  
 Joshua Baller, 2/12, Ph.D. in Biomedical Informatics and Computational Biology  
 Fengli Fu, 12/11, Ph.D. in Bioinformatics & Computational Biology  
 Jiquan Gao, 8/09, Ph.D. in Microbiology  
 Justin Hoshaw, 6/12, MBS in Cellular & Developmental Biology  
 Yi Hou, 12/08, Ph.D. in Molecular, Cellular & Developmental Biology  
 Robert Dick, 08/07, Masters in Genetics  
 Troy Brady, 05/07, Ph.D. in Molecular Cellular & Developmental Biology  
 Junbiao Dai, 8/06, Ph.D. in Molecular Cellular & Developmental Biology  
 Ericka Havecker 5/05, Ph.D. in Genetics  
 Brooke Peterson-Burch, 5/02, Ph.D. in Genetics  
 Peter Fuerst, 5/03, Ph.D. in Molecular, Cellular & Developmental Biology  
 Weiwu Xie, 5/03, Ph.D. in Genetics  
 Xiang Gao, 5/02, Ph.D. in Molecular, Cellular & Dev, Biology and Bioinformatics & Computational Biology  
 Yvette Chen, 12/01, Masters in Genetics  
 T. Vigdal, 5/01, MBS in Bioinformatics and Computational Biology  
 Yunxia Zhu, 5/01, Ph.D. in Molecular, Cellular & Developmental Biology, Minor in Computer Science  
 David Wright, 12/97, Masters in Genetics; 12/00, Ph.D. in Genetics  
 Phillip Irwin, 5/00, Masters in Genetics  
 Xiaowu Gai, 5/99, Ph.D. in Genetics  
 Ning Ke, 5/97, Ph.D. in Genetics  
 Jin M. Kim, 8/96, Masters in Genetics  
 Sige Zou, 5/96, Ph.D. in Molecular Cellular & Developmental Biology

**CURRENT GRADUATE STUDENTS:**

<b>Name</b>	<b>Degree</b>	<b>Major</b>	<b>Est. Graduation</b>
James Chamness	Ph.D.	Molecular, Cellular & Developmental Biology	12/2022
Redeat Tibebu	Ph.D.	Molecular, Cellular & Developmental Biology	12/2023
Abe Steinberger	Ph.D.	Plant & Microbial Biology	05/2028

**POSTDOCTORAL FELLOWS TRAINED:**

Yang Liu, Ph.D., 2019-2021. Postdoctoral Associate, Oak Ridge National Laboratory.  
 Arjun Khakhar, Ph.D., 2018-2020. Senior Scientist, Flagship Labs 70.  
 Matt Nelson, Ph.D., 2017-2018. Molecular Diagnostics Manager, Zepto Life Technology  
 Nathaniel Graham, Ph.D., 2016-2018. Molecular Biology Scientist at Pairwise Plants  
 Jarryd Campbell, Ph.D., 2017-2018. Research Scientist at Recombinetics, Inc.  
 Eva Konecna, Ph.D., 2015-2017. Staff scientist, Inari Agriculture  
 Tomas Cermak, Ph.D., 2010-2017. Senior scientist, Inari Agriculture  
 Qiwei Shan, Ph.D., 2015-2018. Staff scientist, Calyxt Inc.  
 Joe Belanto, Ph.D., 2015-2017. TBD

Aaron Hummell, Ph.D., 2013-2015. Head of Genome Editing Technologies, Pairwise Plants  
 Javier Gil-Humanes, Ph.D., 2012-2015. Product Portfolio Manager, Calyxt  
 Tianheng Ren, Ph.D., 2012-2014. Sichuan Agricultural University, Associate Professor  
 Zach Demorest, Ph.D., 2010-2012. Technology and IP Management, Calyxt  
 Kim Nguyen, Ph.D., 2009-2012. Research Associate, Spitale lab at UC Irvine  
 Yiping Qi, Ph.D., 2009-2013. Assistant professor, University of Maryland  
 Feng Zhang, Ph.D., 2008-2010. Assistant Professor, University of Minnesota

**CURRENT POSTDOCTORAL FELLOWS:**

<b>Name</b>	<b>Degree</b>	<b>Research Area</b>	<b>Start Date</b>
Can Baysal	Ph.D.	Developing vectors to deliver gene editing reagents	10/2021

**CURRENT RESEARCH ASSOCIATES, SCIENTISTS, STAFF:**

<b>Name</b>	<b>Degree</b>	<b>Position</b>	<b>Start Date</b>
Jon Cody	Ph.D.	Researcher 5	06/2021
Nick Klejescki	BS	Researcher 2	08/2022
Degao Liu	Ph.D.	Researcher 5	01/2020
Kit Leffler	M.F.A.	Administrative Associate/Project Manager	08/2012
Lynn Prichard	Ph.D.	Researcher 4	07/2021
Erik Myers	BS	Researcher 3	08/2022
Colby Starker	Ph.D.	Researcher 7/Lab Manager	01/2010

**VISITING SCHOLARS:**

<b>Name</b>	<b>Home Institution</b>	<b>Visit Dates</b>
Gongyao Shi	School of Agriculture Sciences, Zhengzhou University	06/2021
Tendekai Mahlanza	Agricultural Research Council, South Africa	08-11/2019
Ariadne Lopo de Sá	University of São Paulo	08/2018
Xu Tang	University of Electronic Science and Technology of China	06-11/2018
Hiroaki Saika	Institute of Agrobiological Sciences, NARO, Japan	05-11/2018
Hui Zhao	Chinese Academy of Tropical Agricultural Science	01-06/2018
Sripad Joshi	McGill University, Quebec, Canada	03/2018
Shrikant Sharma	Aarhus University, Flakkebjerg, Denmark	10-11/2017
Susana Sanchez Leon	Instituto de Agricultura Sostenible, Cordoba, Spain	07-10/2016
My Tra Thi Vo	International Rice Research Institute	07-08/2016
Xiang Ji	University of Electronic Science and Technology of China	07/2015-05/2016
Conrado Dueñas Jr.	International Rice Research Institute	05-06/2015
Perigio Francisco Jr.	International Rice Research Institute	05-06/2015
Xu Tang	University of Electronic Science and Technology of China	12/2014-07/2015
Viktor Tokan	Institute of Biophysics, Czech Academy of Sciences	09-12/2014
Radim Cegan	Institute of Biophysics, Czech Academy of Sciences	08-11/2014
Christian Cantos	International Rice Research Institute	10-11/2014
Vojta Hudzieczek	Institute of Biophysics, Czech Academy of Sciences	01-06/2014
Yong Zhang	University of Electronic Sciences & Technology of China	08-10/2013
Josep Cascuberta	Center for Research in Agricultural Genomics, Spain	01-06/2011

## TEACHING

### **COURSES TAUGHT AT THE UMN- ALL 3 CREDIT COURSES**

<b>Course #</b>	<b>Title</b>	<b>Year(s)</b>	<b>Term</b>
GCD 4034*	Molecular Genetics & Genomics	2021 - Current	Fall
GCD 8008	Mammalian Gene Transfer & GE	2021	Spring
GCC 3017***	World Food Problems	2020	Fall
GCD 4034	Molecular Genetics & Genomics	2020	Fall
GCD 8008	Mammalian Gene Transfer & GE	2010 - 2020	Spring
Biology 3020*	Molecular Biology & Society	2016 - 2019	Fall
Biology 4003*	Genetics	2014 - 2015	Fall
Biology 4003	Genetics	2012 – 2013	Fall
Biology 4003*	Genetics	2011	Spring
GCD 8131**	Advanced Genetics	2011 - 2018	Spring
GCD 8031***	Advanced Genetics & Genomics	2011	Spring, Fall
Biology 4004*	Cell Biology	2008-2009	Spring, Fall

\* Co-taught course; \*\* Taught 5 lectures, \*\*\* Guest lecturer

## OTHER SERVICE ACTIVITIES

### **PROFESSIONAL MEMBERSHIPS**

National Academy of Science  
American Association for the Advancement of Science  
American Society of Plant Biologists  
American Society for Microbiology  
Genetics Society of America

### **INTERNAL SERVICE AT THE UNIVERSITY OF MINNESOTA**

2020 - Present CBS Faculty Consultative Committee  
2018 – Present Director, Center for Precision Plant Genomics  
2016 – Present Director, Hackett Fund for Genome Engineering  
2022 GCD Faculty Search Committee, Department of Genetics, Cell Biology and Development  
2022 Reviewer, Research Technical Staff Award 2022  
2020 Interviewer, 2nd Annual BGREAT Diversity Conference in Biomedical Science  
2019 – 2020 Faculty Search, Department of Genetics, Cell Biology and Development  
2014 – 2015 Faculty Search, Computational and Genome-Enabled Biology Cluster Hire Committee  
2013 – 2014 Faculty Search, Genome Variation Cluster Hire Committee  
2013 CBS/CFANS Merger Committee  
2012 – 2013 Planning Committee for the University of Minnesota Medical School  
2010 – 2018 Steering Committee, Microbial and Plant Genomics Institute  
2009 – Present Executive Committee, Institute of Human Genetics  
2008 – 2012 Recruitment committee for Molecular, Cellular, Developmental Biology and Genetics  
2008 – 2009 Faculty Search, Department of Plant Biology

### **PUBLIC AND EXTERNAL SERVICE**



2022 – Current Editorial board member, Science China Life Sciences  
 2022 – current TANGENC Advisory Board member, TowArds Next GENERation Crops (TANGENC)  
 2022 Advisory board member, NovoCrops.  
 2021 Department of Energy Office of Science, 2021 Ernest Orlando Lawrence Awards Reviewer  
 2021 NSF Plant Genome Research Program (PGRP) Proposal Review: TRTech-PGR: Nanotechnology-Based, Genotype-Flexible Genome Editing In Plants  
 2017 – 2018 Panel member, National Science Foundation, Emerging Frontiers in Research and Innovation: Chromatin and Epigenetic Engineering  
 2017 Co-grant advisor, Gates Foundation, SAB Rice Blight project  
 2007 – 2008 Panel member, National Science Foundation, MCB Genes and Genome Systems  
 2005 – 2006 Ad hoc panel member, National Institutes of Health, Genes, Genomes and Genetics  
 2004 – 2005 Chair, American Cancer Society Molecular and Cell Biology of Cancer  
 2004 – 2008 Panel member, Damon-Runyon Cancer Fund Postdoctoral Fellowships  
 2003 Site visit team member, National Science Foundation, Plant Genome  
 2002 – 2003 Panel Member, National Science Foundation Plant Genome  
 2002 – 2005 Panel member, American Cancer Society, Molecular and Cell Biology of Cancer  
 2001 Site visit team member, National Cancer Institute, Frederick, MD  
 1999 Panel member, National Science Foundation, Integrative Graduate Education Research & Training Grants  
 2000 Ad hoc panel member, American Cancer Society, Molecular and Cell Biology of Cancer

***SYMPOSIA ORGANIZED***

2020 – 2021 Co-organizer for Keystone Plant Genome Engineering: From Lab to Field, Keystone, CO  
 2018 Co-organizer for Keystone Precision Genome Editing with Programmable Nucleases, Keystone, CO  
 2018 Organizing committee member, 3rd International Conference on One Medicine One Science (iCOMOS), Minneapolis, MN  
 2017 Co-organizer for Precision Genome Editing with Programmable Nucleases  
 2016 Co-organizer for Plant Genome Stability and Change Conference, Yokosuka, Japan  
 2014 – 2016 Plant Genome Engineering Workshop, Plant & Animal Genome Conference, San Diego, CA  
 2014 Co-organizer for Plant Genome Stability and Change Conference, Pacific Grove, CA  
 2009 Co-organizer for FASEB Summer Research Conference, Genome Engineering, Steamboat Springs, CO  
 2009 Co-organizer for American Society of Microbiology Symposium: Mobile DNA, Montreal, Canada  
 2006 Organizer, 6th Annual Joint Bioinformatics Symposium, Ames, Iowa  
 2006 Co-organizer for American Society of Microbiology Symposium: Mobile DNA, Banff, Alberta, Canada  
 2003 Co-organizer for Keystone Symposium: Transposable elements and other genome rearrangements, Santa Fe, New Mexico  
 2003 Co-organizer for PSI Symposium: Transposition, recombination and application to plant genomes, Iowa State University  
 2000 Co-chair, Inter-Iowa Genetics Symposium