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Education:

B.Sc Crop Science, Cum Laude, California Polytechnic State University, Pomona (2000-2003)
Ph.D Plant Pathology, University of California, Riverside (2003-2007)

Professional appointments:

Joint Faculty: Oak Ridge Institute (June 2020 - Present)
Joint Faculty: Bredesen Center for Interdisciplinary Research (January 2017 - Present)
Joint Faculty: Plant Sciences Dept., University of Tennessee, Knoxville (May 2015 - Present)
Geneticist: Oak Ridge National Laboratory (October 2010 - Present)
Postdoctoral Scholar: University of California, Riverside (February 2008 - September 2010)

External funding:

Co-PI: DOE, 2023 - 2028 (\$125M): Center for Bioenergy Innovation.
Co-PI: DOE, 2022 -2025 (\$2.7M): WNTR
Co-PI: DOE, 2019 – 2022 (\$2.5M): Combining genome-wide association studies and expression quantitative trait nucleotide mapping with molecular and genetic validations to identify transcriptional networks regulating drought tolerance in *Populus*.
Co-PI: DOE, 2019 - 2022 (\$21.2M): Plant Microbe Interfaces (PMI).
Co-PI: DOE/USDA Feedstocks Genomics, 2018 - 2021 (\$1.2M): Towards durable resistance to *Septoria* stem canker and leaf spot: a molecular understanding of resistance.
Co-PI: DOE, 2018 - 2023 (\$125M): Center for Bioenergy Innovation.
PI: DOE Early Career Award, 2017 - 2021 (\$2.5M): Host genetic features mediating symbiotic Interactions in *Salix spp.*
Co-PI: NSF PGRP, 2017 - 2021 (\$4.0M): Analysis of genes affecting plant regeneration and transformation in poplar.

Intellectual property:

Patents:

1. Pan domain activates ubiquitination. United States patent US 18,323,672. 2024 Jan 4.
2. Methods for immunoregulation by modulating plasminogen-apple-nematode (pan) domain-containing proteins. United States patent application US 17/012,139. 2021 Mar 11.
3. Transcription Factor Which Regulates Flavonoid, Phenylpropanoid, Tyrosine, and Tryptophan Pathways. United States patent US 20,150,353,948. 2015 Dec 10.
4. KEY GENE REGULATING PLANT CELL WALL RECALCITRANCE. United States patent US 20,160,053,275. 2016 Feb 25.

5. Complex of mutualistic microbes designed to increase plant productivity. United States patent US 10,660,340. 2020 May 26.
6. Methods for improving callus formation and regeneration in plants. United States patent application US 16/525,724. 2020 Jan 30.
7. Methods of improving mycorrhization in plants and genetically modified plants with improved mycorrhization. United States patent application US 16/520,967. 2020 Jan 30.
8. Methods of identifying and modulating pathogen resistance in plants. United States patent application US 16/148,319. 2019 Jun 27.
9. Methods of controlling vegetative growth and flowering times by modulating phosphoenolpyruvate shunt between shikimate and glycolysis pathways. United States patent application US 16/183,074. 2019 May 9
10. Filamentous fungi capable of producing very long chain fatty acids. US Patent App. 16/381,521, 2020.

Selected publications:

1. Nagle MF, Yuan J, Kaur D, Ma C, Peremyslova E, Jiang Y, Niño de Rivera A, Jawdy S, Chen JG, Feng K, Yates TB...**Muchero W**...Strauss, S. GWAS supported by computer vision identifies large numbers of candidate regulators of in planta regeneration in *Populus trichocarpa*. **G3: Genes, Genomes, Genetics**. 2024 Feb 7;jkae026.
2. Argiroff WA, Carrell AA, Klingeman DM, Dove NC, **Muchero W**, Veach AM, Wahl T, Lebreux SJ, Webb AB, Peyton K, Schadt CW. Seasonality and longer-term development generate temporal dynamics in the *Populus* microbiome. **Msystems**. 2024 Feb 29:e00886-23.
3. Yao T, Zhang J, Yates TB, Shrestha HK, Engle NL, Ployet R, John C, Feng K, Bewg WP, Chen MS, Lu H...**Muchero W***. Expression quantitative trait loci mapping identified PtrXB38 as a key hub gene in adventitious root development in *Populus*. **New Phytologist**. 2023 Sep;239(6):2248-64.
4. O'Banion BS, Jones P, Demetros AA, Kelley BR, Knorr LH, Wagner AS, Chen JG, **Muchero W**, Reynolds TB, Jacobson D, Lebeis SL. Plant myo-inositol transport influences bacterial colonization phenotypes. **Current Biology**. 2023 Aug 7;33(15):3111-24.
5. Zhang J, Wang X, Wang HT, Qiao Z, Yao T, Xie M, Urbanowicz BR, Zeng W, Jawdy SS, Gunter LE, Yang X...**Muchero W***, Chen J-G* Overexpression of REDUCED WALL ACETYLATION C increases xylan acetylation and biomass recalcitrance in *Populus*. **Plant physiology**:kiad377.
6. Pal D, De K, Yates TB, Kolape J, **Muchero W**. Mutating novel interaction sites in NRP1 reduces SARS-CoV-2 spike protein internalization. **Science**. 2023 Apr 21;26(4):106274.
7. Hyden B, Feng K, Yates TB, Jawdy S, Cereghino C, Smart LB*, **Muchero W***. *De Novo* Assembly and Annotation of 11 Diverse Shrub Willow (*Salix*) Genomes Reveals Novel Gene Organization in Sex-Linked Regions. **International Journal of Molecular Sciences**. 2023 Feb 2;24(3):2904.

8. Li M, Yao T, Lin W, Hinckley WE, Galli M, Muchero W, Gallavotti A, Chen JG, Huang SS. Double DAP-seq uncovered synergistic DNA binding of interacting bZIP transcription factors. *Nature communications*. 2023 May 5;14(1):2600.
9. Liu D, Tang D, Xie M, Zhang J, Zhai L, Mao J, Luo C, Lipzen A, Zhang Y, Savage E, Yuan G...**Muchero W**...Yang X. Agave REVEILLE1 regulates the onset and release of seasonal dormancy in *Populus*. *Plant physiology*. 2023 Mar 1;191(3):1492-504.
10. Nagle MF, Yuan J, Kaur D, Ma C, Peremyslova E, Jiang Y, Zahl B, Niño de Rivera A, **Muchero W**, Fuxin L, Strauss SH. GWAS identifies candidate genes controlling adventitious rooting in *Populus trichocarpa*. *Horticulture Research*. 2023 Aug;10(8):uhad125.
11. Yuan G, Lu H, De K, Hassan MM, Liu Y, Islam MT, **Muchero W**, Tuskan GA, Yang X. Split selectable marker systems utilizing inteins facilitate gene stacking in plants. *Communications Biology*. 2023 May 26;6(1):567.
12. Yao T, Yuan G, Lu H, Liu Y, Zhang J, Tuskan GA, Muchero W, Chen JG, Yang X. CRISPR/Cas9-based gene activation and base editing in *Populus*. *Horticulture Research*. 2023 May 3:uhad085.
13. Andrews HB, Wymore AM, Wetter EE, Herndon EM, Li H, Martin SA, Griffiths NA, Yang X, **Muchero W**, Weston DJ, Martin MZ. Rapid screening of wood and leaf tissues: investigating silicon-based phytoliths in *Populus trichocarpa* for carbon storage applications using laser-induced breakdown spectroscopy and scanning electron microscopy–energy dispersive X-ray spectroscopy. *Journal of Analytical Atomic Spectrometry*. 2023;38(11):2353-64.
14. Carrell, A.A., Clark, M., Jawdy, S., **Muchero, W.**, Alexandre, G., Labbé, J.L. and Rush, T.A., 2023. Interactions with microbial consortia have variable effects in organic carbon and production of exometabolites among genotypes of *Populus trichocarpa*. *Plant Direct*, 7(11), p.e544.
15. Voothuluru P, Hamilton C, Kim K, Beason J, McCord J, Rousseau R, **Muchero W**, Rials T, Labbé N. Bark morphological and chemical features are differentially correlated with disease resistance and yield in hybrid poplar taxa. *GCB Bioenergy*. 2023 Sep;15(9):1140-53.
16. Bryant N, Muchero W, Weber RA, Barros J, Chen JG, Tschaplinski TJ, Pu Y, Ragauskas AJ. Cell wall response of field grown *Populus* to *Septoria* infection. *Frontiers in Plant Science*. 2023 Jun 7;14:1089011.
17. Bryant N, Zhang J, Feng K, Shu M, Ployet R, Chen JG, **Muchero W**, Yoo CG, Tschaplinski TJ, Pu Y, Ragauskas AJ. Novel candidate genes for lignin structure identified through genome-wide association study of naturally varying *Populus trichocarpa*. *Frontiers in Plant Science*. 2023 May 5;14:1153113.
18. Yuan G, Liu Y, Yao T, **Muchero W**, Chen JG, Tuskan GA, Yang X. eYGF^{Puv}-Assisted Transgenic Selection in *Populus deltoides* WV94 and Multiplex Genome Editing in Protoplasts of *P. trichocarpa* × *P. deltoides* Clone ‘52-225’. *Plants*. 2023 Apr 14;12(8):1657.
19. Shrestha H, Yao T, Qiao Z, **Muchero W**, Hettich RL, Chen JG, Abraham PE. Lectin Receptor-like Kinase Signaling during Engineered Ectomycorrhiza Colonization. *Cells*. 2023 Apr 4;12(7):1082.
20. Hassan MM, Martin S, Feng K, Yates TB, Yuan G, Martin MZ, Martin S, **Muchero W**, Griffiths NA, Weston DJ, Yang X. Genome-wide identification and functional prediction of silicon (Si) transporters in poplar (*Populus trichocarpa*). *Plant Biotechnology Reports*. 2023 Apr;17(2):285-302.

21. John CW, Queen O, **Muchero W***, Emrich SJ*. Deep Learning for Reference-Free Geolocation for Poplar Trees. *arXiv preprint arXiv:2301.13387*. 2023 Jan 31.
22. Saint-Vincent, Patricia MB; Furches, Anna; Galanie, Stephanie; Prates, Erica Teixeira; Aldridge, Jessa L; Labbe, Audrey; Zhao, Nan; Martin, Madhavi Z; Ranjan, Priya; Jones, Piet...**Muchero W**...Tschaplinski Validation of a metabolite–GWAS network for Populus trichocarpa family 1 UDP-glycosyltransferases. *Frontiers in Plant Science*. 2023
23. Pal D, De K, Shanks CM, Feng K, Yates TB, Morrell-Falvey J, Davidson RB, Parks JM, **Muchero W**. Core cysteine residues in the Plasminogen-Apple-Nematode (PAN) domain are critical for HGF/c-MET signaling. *Communications Biology*. 2022 Jul 1;5(1):646.
24. Badré A, Zhang L, **Muchero W**, Reynolds JC, Pan C (2021). Deep neural network improves the estimation of polygenic risk scores for breast cancer. *Journal of Human Genetics*:359-69.
25. Yates TB, Feng K, Zhang J, Singan V, Jawdy SS, Ranjan P, Abraham PE, Barry K, Lipzen A, Pan C, Schmutz J...**Muchero W** (2021). The ancient Salicoid genome duplication event: A platform for reconstruction of de Novo gene evolution in Populus trichocarpa. *Genome Biology and Evolution* 13(9):evab198.
26. Qiao Z, Yates TB, Shrestha HK, Engle NL, Flanagan A, Morrell-Falvey JL, Sun Y, Tschaplinski TJ, Abraham PE, Labbé J, Wang ZY...**Muchero W***, **Chen J-G*** (2021). Towards engineering ectomycorrhization into switchgrass bioenergy crops via a lectin receptor-like kinase. *Plant Biotechnology Journal*. doi.org/10.1111/pbi.13671.
27. Xie M, Zhang J, Yao T, Bryan AC, Pu Y, Labbé J, Pelletier DA, Engle N, Morrell-Falvey JL, Schmutz J, Ragauskas AJ...**Muchero W***, **Chen J-G*** (2020). Arabidopsis C-terminal binding protein ANGUSTIFOLIA modulates transcriptional co-regulation of MYB46 and WRKY33. *New Phytologist*. doi.org/10.1111/nph.16826.
28. Zhang J, Xie M, Li M, Ding J, Pu Y, Bryan AC, Rottmann W, Winkeler KA, Collins CM, Singan V, Lindquist EA...**Muchero W***, **Chen J-G*** (2020). Overexpression of a Prefoldin β subunit gene reduces biomass recalcitrance in the bioenergy crop Populus. *Plant Biotechnology Journal* 18:859-71.
29. Xie M, Zhang J, Singan VR, McGranahan MJ, LaFayette PR, Jawdy SS, Engle N, Doeppke C, Tschaplinski TJ, Davis MF, Lindquist E...**Muchero W***. (2020). Identification of functional single nucleotide polymorphism of *Populus trichocarpa* PtrEPSP-TF and determination of its transcriptional effect. *Plant Direct* 4:e00178.
30. Blumstein M, Richardson A, Weston D, Zhang J, **Muchero W**, Hopkins R (2020). A New Perspective on Ecological Prediction Reveals Limits to Climate Adaptation in a Temperate Tree Species. *Current Biology* 30: 1447-1453.
31. Labbé J*, **Muchero W***, Czarnecki O, Wang J, Wang X, Bryan AC, Zheng K, Yang Y, Xie M, Zhang J, Wang D. (2019) Mediation of plant–mycorrhizal interaction by a lectin receptor-like kinase. *Nature Plants* 5:676-80.
32. **Muchero W**, Sondreli KL, Chen JG, Urbanowicz BR, Zhang J, Singan V, Yang Y, Brueggeman RS, Franco-Coronado J, Abraham N, Yang JY. (2018) Association mapping, transcriptomics, and transient expression identify candidate genes mediating plant–pathogen interactions in a tree. *Proceedings of the National Academy of Sciences* 115:11573-8.

33. Xie M*, **Muchero W*** (*co-1ST author and Corresponding author*), Bryan AC, Yee KL, Guo HB, Zhang J, Tschaplinski T, Singan VR, Lindquist E, Payyavula RS, Barros-Rios J et al. (2018). A 5-enolpyruvylshikimate 3-phosphate synthase functions as a transcriptional repressor in *Populus*. *The Plant Cell* tpc-00168.
34. Zhang J, Yang Y, Zheng K, Xie M, Feng K, Jawdy SS, Gunter LE, Ranjan P, Singan VR, Engle N, Lindquist E...**Muchero W***. (2018) Genome-wide association studies and expression-based quantitative trait loci analyses reveal roles of HCT 2 in caffeoylquinic acid biosynthesis and its regulation by defense-responsive transcription factors in *Populus*. *New Phytologist* Doi.org/10.1111/nph.15297.
35. Bryan AC, Zhang J, Guo J, Ranjan P, Singan V, Barry K, Schmutz J, Weighill D, Jacobson D, Jawdy S, Tuskan GA...**Muchero W***. (2018) A variable polyglutamine repeat affects subcellular localization and regulatory activity of a *Populus* ANGUSTIFOLIA protein. *G3: Genes, Genomes, Genetics* 8:G3-200188.
36. Lang D, Ullrich KK, Murat F, Fuchs J, Jenkins J, Haas FB, Piednoel M, Gundlach H, Van Bel M, Meyberg R, Vives C...**Muchero W**...Rensing SA. (2018). The *Physcomitrella patens* chromosome-scale assembly reveals moss genome structure and evolution. *The Plant Journal* 93: 515-33.
37. Yang X, Hu R, Yin H, Jenkins J, Shu S, Tang H, Liu D, Weighill DA, Yim WC, Ha J, Heyduk K...**Muchero W**...Tuskan GA. (2017). The *Kalanchoë* genome provides insights into convergent evolution and building blocks of crassulacean acid metabolism. *Nature communications* 8: 1899.
38. Meng X, Pu Y, Yoo CG, Li M, Bali G, Park DY, Gjersing E, Davis MF, **Muchero W**, Tuskan GA, Tschaplinski TJ (2017) An In-Depth Understanding of Biomass Recalcitrance Using Natural Poplar Variants as the Feedstock. *ChemSusChem* 10: 139-50.
39. Bryan AC, Jawdy S, Gunter L, Gjersing E., Sykes R, Hinchee MA, Winkeler KA, Collins CM, Engle N, Tschaplinski J, Yang X, Tuskan GA, **Muchero W***, Chen JG*. (2016). Knockdown of a laccase in *Populus deltoides* confers altered cell wall chemistry and increased sugar release. *Plant biotechnology Journal* 14: 2010-2020.
40. Stevenson SR, Kamisugi Y, Trinh CH, Schmutz J, Jenkins JW, Grimwood J, **Muchero W**, Tuskan GA, Rensing SA, Lang D, Reski R. (2016). Genetic analysis of *Physcomitrella patens* identifies ABSCISIC ACID NON-RESPONSIVE (ANR), a regulator of ABA responses unique to basal land plants and required for desiccation tolerance. *The Plant Cell*, pp.tpc-00091.
41. Bhagia S, **Muchero W**, Kumar R, Tuskan GA, Wyman CE. (2016). Natural genetic variability reduces recalcitrance in poplar. *Biotechnology for biofuels* 9: 1.
42. Yang Y, Labbé J, **Muchero W**, Yang X, Jawdy SS, Kennedy M, Johnson J, Sreedasyam A, Schmutz J, Tuskan GA, Chen JG. (2016). Genome-wide analysis of lectin receptor-like kinases in *Populus*. *BMC genomics* 17: 699.
43. Zheng K, Wang X, Weighill DA, Guo HB, Xie M, Yang Y, Yang J, Wang S, Jacobson DA, Guo H **Muchero W**, Chen JG. (2016). Characterization of DWARF14 Genes in *Populus*. *Scientific reports* 6: 21593.
44. Dumitrache A, Akinosho H, Rodriguez M, Meng X, Yoo CG, Natzke J, Engle NL, Sykes RW, Tschaplinski TJ, **Muchero W**, Ragauskas AJ. (2016). Consolidated bioprocessing of *Populus* using *Clostridium (Ruminiclostridium) thermocellum*: a case study on the impact of lignin composition and structure. *Biotechnology for biofuels*, 9: 1.

45. **Muchero W***, Guo J, DiFazio SP, Chen J-G, Ranjan P, Slavov GT, Gunter L, Jawdy S, Bryan AC, Sykes R, Ziebell A, Klápště J, Porth I, Skyba O, Unda F, El-Kassaby Y, Douglas CJ, Mansfield SD, Martin J, Schackwitz W, Evans LM, Czarnecki O, Tuskan GA. (2015) High-resolution Genetic Mapping of Allelic Variants Associated with Cell Wall Chemistry in *Populus*. *BMC Genomics* 16:24.

46. Evans LM, Slavov GT, Rodgers-Melnick, Martin J, Ranjan P, **Muchero W**, Schackwitz, Chen J-G, Brunner A, Tuskan GA, DiFazio SP. (2014). *Populus trichocarpa* population genomics, signatures of selection and adaptive trait associations. *Nature Genetics* 46:1089-1096.

47. **Muchero W***, Labbé J, Ranjan P, DiFazio S, Tuskan GA (2014) Genome re-sequencing in *Populus*: Revealing large-scale genome variation and implications on specialized-trait genomics. T. Fenning (ed.) Challenges and Opportunities for the world's Forests in the 21st Century. Springer Academic Publishers. *Forestry Sciences* 81: 587-595.

48. McKown AD, Klápště J, Guy RD, Geraldles A, Porth I, Hannemann J, Friedmann M, **Muchero W**, et al. (2014) Genome-wide association implicates numerous genes underlying trait variation in natural populations of *Populus trichocarpa*. *New Phytologist* 203:535-553.

49. Czarnecki O; Yang J; Wang X; Wang S; **Muchero W**, Tuskan GA, Chen J-G (2014) Characterization of MORE AXILLARY GROWTH Genes in *Populus*. *PLoS ONE* 9: e102757.

50. Weston DJ, Timm CM, Walker AP, Gu L, **Muchero W** et al., (2014) Sphagnum physiology in the context of changing climate: Emergent influences of genomics and host-microbiome interactions to ecosystem function. *Plant Cell & Environment* 38:1737-1751.

51. **Muchero W***, Sewell MM, Ranjan P, Gunter LE, Tschapinski TJ, Yin T, Tuskan GA (2013) Genome anchored QTLs for biomass productivity in Hybrid *Populus* grown under contrasting environments. *PLoS ONE* 8: e54468.

52. Porth I, Klápště J, Skyba O, Hannemann J, Mckown AD, Guy RD, DiFazio SP, **Muchero W**, Ranjan P, Tuskan GA, Friedman C, Ehling J, Cronk QCB, El-Kassaby Y, Douglas CJ, Mansfield SD (2013) Genome-wide association mapping for wood characteristics in *Populus* identifies an array of candidate single nucleotide polymorphisms. *New Phytologist*: 200:710-726.

53. Porth I, Klápště J, Skyba O, Lai BSK, Geraldles A, **Muchero W**, Tuskan GA, Douglas CJ, El-Kassaby Y, Mansfield SD (2013) *Populus trichocarpa* cell wall chemistry and ultrastructure trait variation, genetic control and genetic correlations. *New Phytologist* 197:777-790.

54. Geraldles A, DiFazio S, Slavov GT, Priya R, **Muchero W**, Hannemann J, Gunter L, Wymore AM, Grassa CJ, Farzaneh N, Porth I, Mckown AD, Skyba O, Li E, Fujita M, Klápště J, Martin J, Schackwitz W, Pennacchio C, Rokhsar D, Friedmann MC, Wasteneys GO, Guy RD, El-Kassaby Y, Mansfield SD, Cronk QCB, Ehling J, Douglas CJ, Tuskan GA (2013) A 34K SNP genotyping array for *Populus trichocarpa*: Design, application to

the study of natural populations and transferability to other *Populus* species. *Molecular Ecology Resources* 13:306-323.

55. Slavov GT, DiFazio SP, Martin J, Schackwitz SP, **Muchero W**, Rodgers-Melnick E, Lipphardt MF, Pennacchio CP, Hellsten U, Pennacchio LA, Gunter LE, Ranjan P, Vining K, Pomraning KR, Wilhelm LJ, Pellegrini M, Mockler T, Freitag M, Gerald A, El-Kassaby YA, Mansfield SD, Cronk QCB, Douglas CJ, Strauss SH, Rokhsar D, Tuskan GA (2012) Genome resequencing reveals multiscale geographic structure and extensive linkage disequilibrium in the forest tree *Populus trichocarpa*. *New Phytologist* 196:713-725.
56. Guo J, Morrell-Falvey JL, Labbé JL, **Muchero W**, Kalluri UC, Tuskan GA, Chen JG (2012) Highly efficient isolation of *Populus* mesophyll protoplasts and its application in transient expression assays. *PLoS ONE* 7(9): e44908.
57. Induri BR, Ellis DR, Slavov GT, Yin T, Zhang X, **Muchero W** et al. (2012) Identification of quantitative trait loci and candidate genes for cadmium tolerance in *Populus*. *Tree Physiology* 32: 626-638.
58. **Muchero W** et al. (2011) Genic SNP markers and legume synteny reveal candidate genes underlying QTL for *Macrophomina phaseolina* resistance and maturity in cowpea [*Vigna unguiculata* (L) Walp.] *BMC Genomics* 12:8.
59. **Muchero W** et al. (2010) Restriction site polymorphism-based candidate gene mapping for seedling drought tolerance in cowpea [*Vigna unguiculata* (L.) Walp.]. *Theoretical and Applied Genetics* 120: 509-51.
60. **Muchero W** et al. (2010) QTL analysis for resistance to foliar damage caused by *Thrips tabaci* and *Frankliniella schultzei* (Thysanoptera: Thripidae) feeding in cowpea (*Vigna unguiculata* L. Walp.). *Molecular Breeding* 25: 47-56.
61. **Muchero W** et al. (2009) A consensus genetic map of cowpea [*Vigna unguiculata* (L) Walp.] and synteny based on EST-derived SNPs. *Proceedings of the National Academy of Sciences USA* 106: 18159-18164.
62. **Muchero W** et al. (2009) Mapping QTL for drought stress-induced premature senescence and maturity in cowpea [*Vigna unguiculata* (L.) Walp.] *Theoretical and Applied Genetics* 118: 849-863.

Synergistic Activities:

Chairperson: Southern Forest Tree Improvement Committee

Professional memberships: American Phytopathological Society (2006 – Present), American Society for Plant Biologists (2010 – Present).

Editorial Boards:

- Plant Physiology Journal
- Forestry Research Journal

Press Releases:

1. <https://www.energy.gov/articles/ending-cancer-we-know-it-cancer-moonshot-and-americas-national-labs>

2. <https://www.energy.gov/science/articles/how-plant-biology-research-could-inform-covid-19-treatments>
3. <https://phys.org/news/2023-10-scientists-gene-triggers-root-growth.html>
4. <https://www.oakridger.com/story/news/2022/08/26/ornl-research-could-spur-cancer-therapies/7823764001/>
5. <https://www.npr.org/2019/06/30/737396572/scientists-study-human-cancer-genes-in-plants>
6. <https://www.eurekalert.org/news-releases/866779>
7. <https://www.scienceboard.net/index.aspx?sec=ser&sub=def&pag=dis&ItemID=4427>
8. <https://www.wbir.com/article/news/cancer-predictors-tumor-formations-found-in-tree-dna/51-7ad6bac1-3370-4f72-a47e-f1dcad0e1d58>
9. <https://phys.org/news/2019-02-tree-life-poplar-yield-human.html>
10. <https://phys.org/news/2018-10-genetic-behavior-reveals-death-poplars.html>