



*Philipp W. Simon*  
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and Professor of Horticulture  
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**Education**

Carroll College, Waukesha, WI, Biology, B.S., 1972  
University of Wisconsin, Madison, WI, Genetics, M.S., 1975  
University of Wisconsin, Madison, WI Genetics, Ph.D., 1977

**Employment History**

1990 - present, USDA,ARS Research Geneticist and Professor of Horticulture,  
University of Wisconsin, Madison  
1985 – 1990, USDA,ARS Research Geneticist and Associate Professor of Horticulture,  
University of Wisconsin, Madison  
1980-1985, USDA,ARS Research Geneticist and Assistant Professor of Horticulture,  
University of Wisconsin, Madison  
1978-1980,USDA,ARS Research Geneticist and Adjunct Assistant Professor of Horticulture, University  
of Wisconsin, Madison

**Major Grants 2014-present**

BARD, 2014-2017, \$290,000 (Simon portion \$48,000), “How temperature stress changes carrot flavor:  
Elucidating the genetic determinants of undesired taste in carrots” Ibdah, Tholl, and Simon.

Global Crop Diversity Trust, 2014 -2018, \$360,000, “Utilization of Carrot Crop Wild Relatives for  
Carrot Pre-Breeding in Bangladesh and Pakistan,” Simon (lead), Ali, and Rahim.

USDA--AFRII, 2015-2018, \$500K, “Assessing Genotype by Environment ((G x E)) Interaction and  
Heritability of Vegetable Crops in Organic vs. Conventional Production Systems”, Silva, Meyers, Simon

Global Crop Diversity Trust, 2018-2021, \$360,000 ‘Carrot germplasm development and farmer training for production in stressful environment’ Simon (lead), Rahim, Ali, and Mackinam

USDA-SCRI, 2016-2021, \$3.69M, “Identifying Phenotypes, Markers, and Genes in Carrot Germplasm to Deliver Improved Carrots to Growers and Consumers”; Simon (lead), Colley, Dawson, Tanumihardjo, Spooner, Spalding, Nunez, Van Deynze, Sumner, Roberts, du Toit, Waters, and Iorizzo

USDA-OREI, 2016-2021, \$2.0M, “CIOA2 - Carrot Improvement for Organic Agriculture With Added Grower and Consumer Value”; Simon (lead), Colley, Hoagland, Silva, Roberts, duToit, and Dawson

USDA-OREI, 2021-2025, \$2.8M “Carrot Improvement for Organic Agriculture: Leveraging On-Farm and Below Ground Networks”; Simon (lead), Colley, Hoagland, Silva, Dawson, Freedman, Roberts, Sidhu, and Waters

### **Honors and Awards since 2000**

USDA, ARS Senior Scientist of the Year, Midwest Area, 2001

USDA, Secretary’s Honor Award, for Superior Service, 2002

Elected Fellow of American Society for Horticultural Science, 2002

American Society for Horticultural Science Outstanding Researcher, 2003

Agricultural University of Krakow, Poland, Honorary Doctorate Degree, 2003

American Soc. Horticultural Science, Vegetable Breeding Group, Vegetable Breeding Award, 2013

Dedication Chapter to PWS, Horticultural Reviews 41: xii – xx. 2013

ARS Research National Leadership and Center Directorship Award, 2015

National Association of Plant Breeders Lifetime Achievement Award, 2016

### **Selected Invited Presentations**

Invited Plenary Lecture “Plant breeding to improve both yield and quality: The impossible dream?” Soil and Nutrition Conference, Bionutrient Food Association Stockbridge, MA, February 2016

Invited Plenary Lecture “Carrot breeding to reduce inputs for growers and increase outputs for consumers” National Association of Plant Breeders Meeting, Davis, CA August, 2017

Invited Plenary Lecture “The carrot genome, and beyond” 2nd ISHS International Symposium on Carrot and Other Apiaceae, Krakow, Poland, September, 2108

Invited Lecture “Pigments out of place” CROPS Conference, Huntsville, AL, June, 2019

### **Professional Experience and Service**

#### Research

Development of genetic and genomic tools (maps, markers, etc.) used widely by vegetable crop researchers and seed industry

Genetic improvement and release of widely used fresh market carrot germplasm with improved market yield, color, nutritional quality, flavor, nematode resistance used by seed companies as foundation breeding stocks for the majority of US fresh market carrot production.

Developed the methodology to produce true seed in garlic, leading to the first breeding effort for developing new garlic cultivars

Organization and participation in 9 international and 2 U.S. (1999-2016) germplasm expeditions to collect wild and land race carrots, onions, garlic and their relatives in Central Asia, Europe, north Africa, South and North America

#### Outreach and mentorship

- Collaborative research and training with the global vegetable academic and government institutions, production and seed industry including short-term training of 51 international scientists
- Trained 40 graduate students and 23 post-docs to date

#### Administrative and Leadership Functions

1986 - present, Research Leader of the USDA, ARS Vegetable Crops Research Unit

1989 – 1992, Chair of Graduate Program in Plant Breeding & Plant Genetics, University of Wisconsin

2009 – 2011, Chair of the U.S. Plant Breeding Coordinating Committee, parent organization of the National Association of Plant Breeders

2013 – 2019, Advisor to the RosBREED Scientific, Stakeholder, and Extension Advisory Committee

2019 - present, Chair of the USDA, ARS Breeding Insight Technical Advisory Committee

#### **Recent Selected Publications**

Iorizzo, M., S. Ellison, D. Senalik, P. Zeng, P. Satapoomin, M. Bowman, M. Iovene, W. Sanseverino, P. Cavagnaro, M. Yildiz, A. Macko-Podgórní, E. Moranska, E. Grzebelus, D. Grzebelus, H. Ashrafi, Z. Zheng, S. Cheng, D. Spooner, A. Van Deynze, and **P.W. Simon**. A high-quality carrot genome assembly reveals new insights into carotenoid accumulation and Asterid genome evolution. *Nature Genetics*, 48:657-666. 2016.

**Simon, P.W.**, J. Zystro, P.A. Roberts, T. Waters, J. Colquhoun, J. Navazio, M. Colley, C. McCluskey, L. Hoagland, L. duToit, E. Silva, and J. Nunez. 2017. The CIOA (Carrot Improvement for Organic Agriculture) Project: Location, cropping system, and genetic background influence carrot performance including top height and flavor. *Acta Hort.* 1153: 1-8.

Ellison, S., D. Senalik, H. Bostan, M. Iorizzo, **P.W. Simon**. Fine mapping, transcriptome analysis, and marker development for *Y2*, the gene that conditions beta-carotene accumulation in carrot (*Daucus carota* L.). *G3* 7: 2665-2675. 2017.

Arbizu, C.I., P.M. Tas, **P.W. Simon**, D. M. Spooner. Phylogenetic prediction of *Alternaria* leaf blight resistance in wild and cultivated species of carrots. *Crop Sci.* 57:2645-253. 2017.

Spooner, D.M., H.Ruess, M.Iorizzo, D.Senalik, **P. Simon**. Entire plastid phylogeny of the carrot genus (*Daucus*, Apiaceae): Concordance with nuclear data and mitochondrial and nuclear DNA insertions to the plastid. *Amer. J. Bot.* 104:296-313. 2017.

Mezghani, N., J.B. Amor, D.M. Spooner, **P.W. Simon**, N. Mezghani, H. Boubaker, A. M'rad Namji, S. Rouz, C. Hannachi, M.Neffati, and N. Tarchoun. Multivariate analysis of morphological diversity among closely related *Daucus* species and subspecies in Tunisia. *Genet. Resources Crop Evol.* 64:2145-2159. 2017.

Shiyab, S., and **P.W. Simon**. Effects of direct and gradual salinity exposure on carrot (*Daucus carota* L.) seeds and recovery response. *Acad. J. Biotech.* 5:38-43. 2017.

Macko-Podgórní, A., G. Machaj, K. Stelmach, D. Senalik, E. Grzebelus, M. Iorizzo, **P.W. Simon**, and D. Grzebelus. Characterization of a genomic region under selection in cultivated carrot (*Daucus carota* subsp. *sativus*) reveals a candidate domestication gene. *Frontiers Plant Sci.* 8: 12. 2017.

- Baenziger, P., R. Mumm, R. Bernardo, E.C. Brummer, P. Langridge, **P.W. Simon**, S. Smith. Council for Agricultural Science and Technology (CAST). 2017. Plant Breeding and Genetics—A paper in the series on The Need for Agricultural Innovation to Sustainably Feed the World by 2050. Issue Paper 57. CAST, Ames, Iowa. 2017.
- Turner, S.D., P.L. Maurizio, W. Valdar, B.S. Yandell, and **P.W. Simon**. Dissecting the genetic architecture of shoot growth in carrot (*Daucus carota* L.) using a diallel mating design. *G3* 8:411-426. 2018.
- Mezghani, N., H. Ruess, N. Tarchoun, J. Ben Amor, **P. Simon**, and D. Spooner. Genotyping –by-sequencing reveals the origin of Tunisian relatives of cultivated carrot. *Genet. Resources Crop Evol.* 65:1359-1368. 2018.
- Ellison, S., C. Luby, K. Corak, K. Coe, D. Senalik, M. Iorizzo, I. Goldman, **P. Simon**, and J. Dawson. Association analysis reveals the importance of the *Or* gene in carrot (*Daucus carota* L.) carotenoid presence and domestication. *Genetics* 210: 1139-1141. 2018.
- Turner, S., S. Ellison, D.A. Senalik, **P.W. Simon**, E. Spalding, and N. Miller. An automated image analysis pipeline enables genetic studies of shoot and root morphology in carrot (*Daucus carota* L.). *Front. Plant Sci.* 9: 1703. 2018.
- Byrne, P.F., G.M. Volk, C. Gardner, M.A. Gore, **P.W. Simon**, and S. Smith. Sustaining the future of plant breeding. The critical role of the USDA-ARS National Plant Germplasm System. *Crop Sci.* 58:451–468. 2018. doi:10.2135/cropsci2017.05.0303.
- Bolton, A.. and **P. W. Simon**. Variation for salinity tolerance during seed germination in diverse carrot (*Daucus carota* (L.)) germplasm. *HortScience* 54:38–44. 2019.
- Iorizzo, M., P. Cavagnaro, A. Bostan, Y. Zhao, J. Zhang, and **P.W. Simon**. A cluster of MYB transcription factors regulates anthocyanin biosynthesis in carrot (*Daucus carota* L.) root and petiole. *Frontiers Plant Sci.* 9:1927. 2019.
- Titcomb, T., M. Kaeppler, J. Shannon, **P.W. Simon**, and S. Tanumihardjo. Carrot leaves maintain liver vitamin A concentrations in Mongolian gerbils regardless of the alpha- to beta-carotene ratio when beta-carotene equivalents are equalized. *J. Nutrit.* 149:951-958. 2019.
- Bolton, A., A. Nijabat, M. Mahmood-ur-Rehman, N.H Naveed, A.T.M.M. Mannan, A. Ali, M.A. Rahim, and **P. W. Simon**. Variation for heat tolerance during seed germination in diverse carrot (*Daucus carota* (L.)) germplasm. *HortScience* 54:1470-1476. 2019.
- Titcomb T.J., M.S. Kaeppler, M.E. Cook, **P.W. Simon**, S.A. Tanumihardjo. Carrot leaves improve color and xanthophyll content of egg yolk in laying hens but are not as effective as commercially available marigold fortificant. *Poult. Sci.* 2019; doi: 10.3382/ps/pez257
- Sheftel, J., M. Sowa, L. Mourao, L.T. Zoué, C.R. Davis, **P.W. Simon**, and S.A. Tanumihardjo. Total adipose retinol concentrations are correlated with total liver retinol concentrations in male Mongolian gerbils, but only partially explained by chylomicron deposition assessed with total  $\alpha$ -retinol. *Curr. Dev. Nutr.* 3:nzy096. 2019.
- Corak, K.E., S.L. Ellison, **P.W. Simon**, D.M. Spooner, J.C. Dawson. Comparison of representative and custom methods of generating core subsets of a carrot (*Daucus carota*) germplasm collection. *Crop Sci.* 59:1107-1121. 2019. doi: 10.2135/cropsci2018.09.0602.
- Bannoud, F., S. Ellison, M. Paolinelli, T. Horejsi, D. Senalik, M. Fanzone, M. Iorizzo, **P. Simon**, P. Cavagnaro. Dissecting the genetic control of root and leaf tissue-specific anthocyanin pigmentation in carrot (*Daucus carota* L.) *Theor Appl Genet* 132: 2485-2507. 2019.
- Simon, P.W.**, M. Iorizzo, D. Grzebelus, and R. Baranski (eds) *The carrot genome*, Springer, Cham, Switzerland, 372 pp. 2019.

- Palmieri Rocha, L., S. Ellison, D. Senalik, **P.W. Simon**, and J. Brunet. Genetic markers to detect introgression of cultivar genes into wild carrot populations. *Acta Hort.* 1264: 165-173. 2019
- Sowa, M., L. Mourao, J. Sheftel, M. Kaeppler, G. Simons, C. Davis, **P.W. Simon**, S. Tanumihardjo. Overlapping vitamin A interventions with provitamin A carotenoids and preformed vitamin A fortificant cause high liver retinol stores in male Mongolian gerbils. *J. Nutrit.* 150: 2912–2923. 2020. <https://doi.org/10.1093/jn/nxaa142>
- Curaba J, Bostan H, Cavagnaro PF, Senalik D, Mengist MF, Zhao Y, **Simon PW** and Iorizzo M. 2020. Identification of an SCPL gene controlling anthocyanin acylation in carrot (*Daucus carota* L.) root. *Frontiers in Plant Science* 10:1770. doi: 10.3389/fpls.2019.01770
- Bolton, A., M. Klimek-Chodacka, E. Martin-Millar, D. Grzebelus, and **P.W. Simon** 2020. Genome-assisted improvement strategies for climate resilient carrots. In: C. Kole, editor, *Genomic designing of climate-smart vegetable crops*, Springer, Heidelberg, Germany. p.309-343, DOI: 10.1007/978-3-319-97415-6\_6
- Spooner, D.M., Ruess, H., **Simon, P.W.**, Senalik, D.A. 2020. Mitochondrial DNA sequence phylogeny of *Daucus*. *Systematic Botany*. Volume 46 / Pages 403-408(6). <https://doi.org/10.1600/036364420X15862837791311>
- Macko-Podgórní, A.; Stelmach, K.; Kwolek, K.; Machaj, G.; Ellison, S.; Senalik, D.A.; **Simon, P.W.**; Grzebelus, D. Mining for candidate genes controlling secondary growth of the carrot storage root. *Int. J. Mol. Sci.* 2020, 21, 4263. <https://doi.org/10.3390/ijms21124263>
- Iorizzo, M.; Curaba, J.; Pottorff, M.; Ferruzzi, M.G.; Simon, P.; Cavagnaro, P.F. 2020. Carrot anthocyanin genetics and genomics: Status and perspectives to improve its application for the food colorant industry. *Genes* 2020, 11, 906. <https://doi.org/10.3390/genes11080906>
- Abdelrazek, S., Choudhari, S., Thimmapuram, J., **P.W. Simon**, M. Colley, T. Mengiste and L. Hoagland. 2020. Changes in the core endophytic mycobiome of carrot taproots in response to crop management and genotype. *Sci Rep* 10, 13685.
- Nijabat, A., A. Bolton, M. Mahmood-ur-Rehman, A. Ijaz Shah, R. Hussain, N.H. Naveed, A. Ali, and **P.W. Simon**. 2020. Cell membrane stability and relative cell injury in response to heat stress during early and late seedling stages of diverse carrot (*Daucus carota* L.) germplasm. *HortScience* 55: 1446–1452. 2020. <https://doi.org/10.21273/HORTSCI15058-20>
- Simon, P.W.**, W.R. Rolling, D. Senalik, A.L. Bolton, M. A. Rahim, A.T.M. M. Mannan, F. Islam, A. Ali, A. Nijabat, N. H. Naveed, R. Hussain, A. I. Shah. Wild carrot diversity for new sources of abiotic stress tolerance to strengthen vegetable breeding in Bangladesh and Pakistan. *Crop Sci.* 61:163-176. DOI: 10.1002/csc2.20333
- Coe, K., S. Ellison, D. Senalik, J. Dawson, **P.W. Simon**. 2021. The influence of the *Or* and *Carotene Hydroxylase* genes on carotenoid accumulation in orange carrots [*Daucus carota* (L.)]. *Theor. Applied Genet.* In press.

## Professional Affiliations

Member, AAAS; American Society for Horticultural Science; ISHS; Genetics Society of America; Botanical Society of America; National Association of Plant Breeders