

NAME: Stephen M. Welch

EXPERTISE:

Dr. Welch is a theoretical plant modeler with expertise in gene network modeling, crop photothermal modeling, and methods for relating genotypes onto complex phenotypes

PROFESSIONAL PREPARATION:

B.S., Computer Science, Michigan State University	Dec. 1971
Ph.D., Zoology, Michigan State University	Feb. 1977
Postdoctoral Fellow, Entomology, Michigan State University	Feb.-Oct. 1977

APPOINTMENTS:

1990-present	Full Professor, Department of Agronomy, Kansas State University. Theoretical plant modeling. Acting State Climatologist (1989-92).
1993 (6 mo.)	Assistant to the Vice Provost for Academic Services. Assisted in general technology-related issues and activities as directed by the VPAS.
1992 (5 mo.)	Interim Director, KSU Computing and Network Services. Overall administration of networking, mainframe computing, public computing laboratories, and support activities for Kansas State University.
1987-1989	Computer Systems Coordinator, Kansas Cooperative Extension Service. Overall administration of the Computer Systems Office (which included the KSU Weather Data Library). Policy, planning, personnel, and budgetary management.
1985-1986	Technical Development Coordinator, Kansas Cooperative Extension Service. Needs assessment, financing, and administration of electronic technology development programs for information delivery.
1981-1984	Associate Professor, Department of Entomology, Kansas State University. Design of decision support systems for selected agricultural commodities.
1982 (3 mo.)	Visiting Professor, North Central Computer Institute, Madison, Wisconsin. Computerized teleconferencing applications in multi-state cooperative projects.
1977-1981	Assistant Professor, Department of Entomology, Kansas State University. Pest management modeling of economic insects.

SELECTED PUBLICATIONS:

Weinig C, Ewers BE, Welch SM. Ecological genomics of local adaptation to climate. *Current Opinion in Plant Biology*. *Accepted with revisions*.

Steward, D. R., Bruss, P. J., Yang, X., Staggenborg, S. A., Welch, S. M. and M. D. Apley, Tapping unsustainable groundwater stores for agricultural production in the High Plains Aquifer of Kansas, projections to 2110, *Proceedings of the National Academy of Sciences of the United States of America*, 110(37) E3477-E3486, September 10, 2013.

Cai X, Das S, Welch SM. 2013. A novel strategy for plant breeding based on simulations of gene network models. *International Journal of Bioinformatics Research & Applications*, 9(5):517-33.

Wilczek A, Roe J, Knapp M, Cooper M, Lopez-Gallego CM, Martin L, Muir C, Sim S, Walker A, J. Anderson, Egan J.F., Petipas R., Giakountis A., Charbit E., Coupland G., Welch S.M., and Schmitt J. Seasonal and geographic variation in sensitivity and balance of flowering pathways. *Science*, 15 Jan 2009. doi: 10.1126/science.1165826.

Wilczek AM, Burghardt LT, Cobb AR, Cooper MD, Welch SM, Schmitt J. 2010. Genetic and physiological bases for phenological responses to current and predicted climates. *Phil. Trans. R. Soc. B*, 365:3129-3147.

Welch, S.M., Roe, J.L., Dong, Z. 2003. A genetic neural network model of flowering time control in *Arabidopsis thaliana*. *Agronomy Journal*, 95:71-81.

Das S, Caragea D, Welch S, Hsu W, eds. 2009. *Computational methodologies in gene regulatory networks*. Published by Medical Information Science Reference (an imprint of IGI). New York. 710pp

Koduru P, Dong Z, Das S, Welch SM, Roe J, Charbit E. "Multi-Objective Evolutionary-Simplex Hybrid Approach for the Optimization of Differential Equation Models of Gene Networks", *IEEE Transactions on Evolutionary Computation*, Vol. 12, No. 5, pp. 572 –590, 2008.

Weinig C, Brock MT, Dechaine JA, Welch SM. 2006. Resolving the genetic basis of invasiveness and predicting invasions. *Genetica*. DOI 10.1007/s10709-006-9015-7.

Hammer G, Cooper M, Tardieu F, Welch S, Walsh B, van Eeuwijk F, Chapman S, Podlich D. 2006. Models for navigating biological complexity in breeding improved crop plants. *Trends in Plant Science* 11:587-593.

Welch, S.M., J.L. Roe, S. Das, Z. Dong, R. He, M.B. Kirkham. 2005. Merging genomic control networks with soil-plant-atmosphere-continuum (SPAC) models. *Agricultural Sys.* 86:243-74.

SYNERGISTIC ACTIVITIES:

- Dr. Welch was KSU co-PI in an NSF Frontiers of Integrative Biological Research (FIBR) project. The project involved four US institutions with unfunded collaborators at six European plant molecular genetics labs. Its goal is to study the molecular evolutionary ecology of developmental signaling pathways of *Arabidopsis thaliana* in complex environments from the DNA sequence to continental scales. The five-year project combines approaches from molecular biology, molecular evolutionary genetics, quantitative genetics, evolutionary ecology, gene network modeling, and biogeography. The KSU team was responsible for the mathematical modeling of genetic networks and the micro-meteorological monitoring at all field sites.
- Dr. Welch was a member of the Steering Committee for the Ecological Genomics Institute (EGI) in Kansas. EGI links responses of living systems to environmental change at the genetic level. Most environmental change studies span only one or two levels in the biological hierarchy, but biological responses depend on both genotype and gene-by-environment interactions, the relationships studied here. The EGI integrates the activities of 35 faculty and postdocs.
- Dr. Welch is a member of the Executive Committee of the Consortium for Global Research on Water-based Economies. GRoWE is developing coupled geo-spatial models for groundwater systems that include hydrological, plant, economic, and demographic components. It interacts closely with RIZA, the Dutch research and advisory body for inland waters management, renowned for its broad expertise in water issues world-wide. GRoWE also uses constructivist methods in educational experiments on teaching interdisciplinary topics in Water & Society.