DEPARTMENT OF CHEMISTRY AND ENVIRONMENTAL SCIENCE
SEMINAR SERIES
SPRING 2025

WEDNESDAY, FEBRUARY 19
TIERNAN HALL – LECT. HALL 2,
NJIT, NEWARK
1:00PM-2:20PM

GUEST SPEAKER

Georg Jander, PhD
Professor. George L. McNew Distinguished Scientist
Boyce Thompson Institute for Plant Research and
Cornell University
Ithaca, NY

TOPIC

Biosynthesis and Function of Cardiac Glycosides in Wallflowers

ABSTRACT

The biosynthesis of cardiac glycosides, toxic metabolites that inhibit essential Na^+/K^+-ATPases in animal cells, evolved independently in at least a dozen plant families. At low doses, plant-derived cardiac glycosides have been used for centuries as a treatment for congestive heart failure. More recent research indicates potential applications in treating cancer and other human diseases. We established *Erysimum cheiranthoides* (wormseed wallflower) as a model system for investigating the previously unknown biosynthesis pathway for cardiac glycosides. After sequencing the genome of an inbred *E. cheiranthoides* lineage, we used genetic mapping, phylogenetic comparisons, and co-expression analysis to discover genes involved in cardiac glycoside biosynthesis. The in vivo functions of *E. cheiranthoides* genes were confirmed by making stable transgenic knockouts using CRISPR/Cas9 mutagenesis and quantifying the resulting changes in the cardiac glycoside profile by HPLC-MS. Insect bioassays with *E. cheiranthoides* mutants, both in the laboratory and in the field, determined the defensive properties of different cardiac glycoside profiles.

BIO

2002-present	Professor, Boyce Thompson Institute
2004-present	Adjunct Professor, School of Integrative Plant Sciences, Cornell University
1998-2002	Scientist, Monsanto Company
1996-1998	Postdoc, Massachusetts General Hospital, Advisor: Fred Ausubel
1987-1995	Ph.D. in Microbiology, Harvard University, Advisor: Jon Beckwith
1983-1987	B.S. in Computer Science, Washington University in St. Louis

Honors and Awards Received

2022	Fellow, American Society of Plant Biologists
2019	Sabbatical fellowship, Binational Agricultural Research and Development Agency
2013	Fellow, American Association for the Advancement of Science
2011	Friedrich Wilhelm Bessel Forschungspreis from the Humboldt Foundation
1996	NIH postdoctoral fellowship

1994 Office of Naval Research Fellowship, Marine Biological Laboratories
1987 NSF graduate student fellowship
1987 Tau Beta Pi – engineering honor society
1983 Woodward Scholarship for Engineering, Washington University
1983 National Merit Scholar

Recent Publications

- Negin, B., Wang, F., Fischer, H.D., and Jander, G. (2025). Acylsugars, Nicotine and a Protease Inhibitor Provide Variable Protection for *Nicotiana benthamiana* in a Natural Setting. *Plant Cell Environ* 48, 1073-1087, doi: 10.1111/pce.15195.
- Feiz, L., Shyu, C., Wu, S., Ahern, K.R., Gull, I., Rong, Y., Artymowicz, C.J., Pineros, M.A., Fei, Z., Brutnell, T.P., and Jander, G. (2024). COI1 F-box proteins regulate DELLA protein levels, growth, and photosynthetic efficiency in maize. *Plant Cell* 36, 3237-3259, doi: 10.1093/plcell/koae161.
- Feng, H., and Jander, G. (2024). Serine proteinase inhibitors from *Nicotiana benthamiana*, a nonpreferred host plant, inhibit the growth of *Myzus persicae* (green peach aphid). *Pest Manag Sci* 80, 4470-4481, doi: 10.1002/ps.8148.
- Mirzaei, M., Younkin, G.C., Powell, A.F., Alani, M.L., Strickler, S.R., and Jander, G. (2024). Aphid Resistance Segregates Independently of Cardenolide and Glucosinolate Content in an *Erysimum cheiranthoides* (Wormseed Wallflower) F2 Population. *Plants* (Basel) 13, doi: 10.3390/plants13040466.
- Negin, B., Shachar, L., Meir, S., Ramirez, C.C., Rami Horowitz, A., Jander, G., and Aharoni, A. (2024). Fatty alcohols, a minor component of the tree tobacco surface wax, are associated with defence against caterpillar herbivory. *Plant Cell Environ* 47, 664-681, doi: 10.1111/pce.14752.
- Richter, A., Schroeder, A.F., Marcon, C., Hochholdinger, F., Jander, G., and Negin, B. (2024). Catechol acetylglucose: a newly identified benzoxazinoid-regulated defensive metabolite in maize. *New Phytol* 244, 2474-2488, doi: 10.1111/nph.20209.
- Younkin, G.C., Alani, M.L., Paez-Capador, A., Fischer, H.D., Mirzaei, M., Hastings, A.P., Agrawal, A.A., and Jander, G. (2024). Cardiac glycosides protect wormseed wallflower (*Erysimum cheiranthoides*) against some, but not all, glucosinolate-adapted herbivores. *New Phytol* 242, 2719-2733, doi: 10.1111/nph.19534.
- Feng, H., Chen, W., Hussain, S., Shakir, S., Tzin, V., Adegbayi, F., Ugine, T., Fei, Z., and Jander, G. (2023). Horizontally transferred genes as RNA interference targets for aphid and whitefly control. *Plant Biotechnol* J 21, 754-768, doi: 10.1111/pbi.13992.

Seminar Coordinator:

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