

Curriculum Vitae for Rich Williams

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Education:

Ocean Engineering S.B., S.M., 1981.
Massachusetts Institute of Technology, Cambridge MA.

Physical Oceanography PhD. 1991.
Scripps Institution of Oceanography, Univ. of California, San Diego.

Geophysical Fluid Dynamics Summer School. 1991.
Woods Hole Oceanographic Institution

Complex Systems Summer School. 1997.
Santa Fe Institute

Positions:

1991	Postdoctoral researcher, Scripps Institution of Oceanography
1985-1996	Self-employed computer programmer. Co-author of Turbo Debugger and Turbo Profiler, marketed by Borland International
1997-2006	Grant-funded research scientist at San Francisco State Univ, UC Santa Barbara, Rocky Mtn Biological Lab.
2006-2010	Head, Computational Ecology and Environmental Science Group, Microsoft Research, Cambridge, UK
2010-2011	Senior Scientist, Computational Ecology and Environmental Science Group, Microsoft Research, Cambridge, UK
2011-present	Senior software engineer and data scientist, quantitative visualization, Quid Inc., San Francisco, CA

Papers:

Dyer, I., Baggeroer, A. B., Zittel, J. D. and Williams, R. J. 1982. Acoustic backscattering from the basin and margins of the Arctic Ocean. *J. Geophys. Res. – Oceans and Atm.* 87, 9477-9488.

Armi, L. and Williams, R. 1990. The deep western boundary current off the Newfoundland Ridge. *Deep-Sea Research*, 38, 371-391.

- Williams, R. and Armi, L. 1990. The planetary boundary layer of the deep western boundary current. *Deep-Sea Research*, 38, 392-399.
- Williams, R. and Armi, L. 1991. Two-layer hydraulics with comparable internal wave speeds. *J. Fluid Mech.*, 230, 667-691.
- Armi, L. and Williams, R. 1993. The hydraulics of a stratified fluid flowing through a contraction. *J. Fluid Mech.*, 251, 355-375.
- Williams, R. J. and N. D. Martinez. 2000. Simple rules yield complex food webs. *Nature*, 404, 180-183.
- Dunne, J.A., R.J. Williams, and N.D. Martinez. 2002. Network structure and biodiversity loss in food webs: Robustness increases with connectance. *Ecology Letters* 5:558-567. (An earlier version is Santa Fe Institute Working Paper 02-03-13).
- Williams, R. J., N. D. Martinez, E. L. Berlow, J. A. Dunne and A-L Barabási. 2002. Two Degrees of Separation in Complex Food Webs. *Proc. Nat. Acad. Sci.* 99, 12913-12916. (An earlier version is Santa Fe Institute working paper 01-07-036).
- Dunne, J. A., R. J. Williams and N. D. Martinez. 2002. Food-web structure and network theory: the role of connectance and size. *Proc. Nat. Acad. Sci.* 99, 12917-12922. (An earlier version is Santa Fe Institute working paper 02-03-010).
- Brose, U., N.D. Martinez, and R.J. Williams. 2003. Estimating species richness: Sensitivity to sample coverage and insensitivity to spatial patterns. *Ecology*. 84, 2364-2377.
- Brose, U., R.J. Williams, and N.D. Martinez. 2003. Comment on "Foraging adaptation and the relationship between food-web complexity and stability. *Science* 301, 918b-918c.
- Dunne, J.A., R.J. Williams, N.D. Martinez. 2004. Network structure and robustness of marine food webs. *Marine Ecology Progress Series* 273, 291-302. (An earlier version is Santa Fe Institute Working Paper 03-04-024).
- Williams, R. J. and N. D. Martinez. 2004. Limits to trophic levels and omnivory in complex food webs: theory and data. *American Naturalist* 163, 458-468. (An earlier version was Santa Fe Institute Working Paper 02-10-056).
- Williams, R.J., and N.D. Martinez. 2004 Stabilization of chaotic and non-permanent food-web dynamics. *European Physics Journal B* 38, 297-303. (An earlier version was Santa Fe Institute Working Paper 01-07-037).
- Yoon, I., R.J. Williams, E. Levine, S. Yoon, J.A. Dunne, and N.D. Martinez. 2004. Webs on the Web (WOW): 3D visualization of ecological networks on the WWW for collaborative research and education. *Proceedings of the IS&T/SPIE Symposium on Electronic Imaging, Visualization and Data Analysis Section*, pp. 124-132.

Yoon, I., R.J. Williams, S. Yoon, J.A. Dunne, and N.D. Martinez. 2004. 3D Visualization and analysis of ecological networks. *Proceedings of the Seventh IASTED International Conference on Computer Graphics and Imaging* 224-229.

Bowers, S., Thau, D., Williams, R., and B. Ludaescher. 2005. Data procurement for enabling scientific workflows: on exploring inter-ant parasitism. Pages 57-63 in *Lecture Notes in Computer Science*, Vol. 3372, eds. C. Bussler, V. Tannen, and I. Fundulaki. Springer-Verlag.

Yoon, I., R.J. Williams, S. Yoon, J.A. Dunne, and N.D. Martinez. 2005. Interactive 3D visualization of highly connected ecological networks on the WWW. *ACM Symposium on Applied Computing (SAC 2005), Multimedia and Visualization Section*, pp. 1207-1217.

Brose, U., E.L. Berlow, T. Jansson, C. Banasek-Richter, L.-F. Bersier, J.L. Blanchard, T. Brey, S.R. Carpenter, M.-F. Cattin Blandenier, J.E. Cohen, L. Cushing, H.A. Dawah, T. Dell, F. Edwards, S. Harper-Smith, U. Jacob, R.A. Jnapp, M.E. Ledger, J. Memmott, K. Tintinbeck, J.K. Pinnegar, B.C. Rall, T. Rayner, L. Ruess, W. Ulrich, P. Warren, R.J. Williams, G. Woodward, P. Yodzis, and N.D. Martinez. 2005. Body sizes of consumers and their resources. *Ecology* 86:2545, *Ecological Archives* EO86-135.

Williams, R. J., Martinez, N. D. and Golbeck, J. 2006. Ontologies for Ecoinformatics. *Web Semantics: Science, Services and Agents on the World Wide Web*. **4**, 237-242.

Brose, U., T. Jansson, E.L. Berlow, P. Warren, C. Banasek-Richter, L.-F. Bersier, J. L. Blanchard, T. Brey, S. R. Carpenter, M.-F. Cattin Blandenier, L. Cushing, H.A. Dawah, T. Dell, F. Edwards, S. Harper-Smith, U. Jacob, M. E. Ledger, N.D. Martinez, J. Memmott, K. Mintenbeck, J.K. Pinnegar, B.C. Rall, T.S. Rayner, D. C. Reuman, L. Ruess, W. Ulrich, R.J. Williams, G. Woodward, and J.E. Cohen. 2006. Consumer-resource body-size relationships in natural food webs. *Ecology* 87, 2411-2417 .

Brose, U., R.J. Williams, and N.D. Martinez. 2006. Allometric scaling enhances stability in complex food webs. *Ecology Letters* 9:1228-1236.

Krivov, S., Williams, R. and Villa, F. 2007. GrOWL: A Tool for Visualizing and Editing OWL Ontologies. *Web Semantics: Science, Services and Agents on the World Wide Web*. **5**, 54-57.

Williams, R. J. and N. D. Martinez. 2008. Success and its limits among structural models of complex food webs. *Journal of Animal Ecology*. **77**:512-519.

Sutherland, W. J., Bailey, M. J., Bainbridge, I. P., Brereton, T., Dick, J. T. A., Drewitt, J., Dulvy, N. K., Dusic, N. R., Freckleton, R. P., Gaston, K. J., Gilder, P. M., Green, R. E., Heathwaite, L., Johnson, S. M., Macdonald, D. W., Mitchell, R., Osborn, D., Owen, R. P., Pretty, J., Prior, S. V., Prosser, H., Pullin, A. S., Rose, P., Stott, A., Tew, T., Thomas, C. D., Thompson, D. B. A., Vickery, J. A., Walker, M., Walmsley, C., Warrington, S., Watkinson, A. R., Williams, R. J., Woodroffe, R., Woodroof, H. J. 2008. Future novel threats and opportunities facing UK biodiversity identified by horizon scanning. *Journal of Applied Ecology*. **45**:821-833.

Williams, R.J. 2008. Effects of network and dynamical model structure on species persistence in large model food webs. *Theoretical Ecology*, **1**:141-151.

J. A. Dunne, R.J. Williams, N.D. Martinez, R.A. Wood, D.H. Erwin, 2008. Compilation and network analyses of Cambrian food webs, *PLoS Biology*, **6**:e102.

Berlow, E.L., Dunne, J. A., Martinez, N. D., Stark, P. B., Williams, R.J., and Brose, U. 2009. Simple prediction of interaction strengths in complex food webs. *Proc. Nat. Acad. Sci.* **106**:187-191.

Dunne, J.A. and Williams, R.J. 2009. Cascading extinctions and community collapse in model food webs. *Phil Trans Roy Soc B.* **364**:1743-1754.

Romanuk, T.N., Zhou, Y., Brose, U., Berlow, E.L., Williams, R.J., Martinez, N.D. 2009. Predicting invasion success in complex ecological networks. *Phil Trans Roy Soc B.* **364**:1743-1754.

Williams, R.J. 2010. Simple MaxEnt models explain food web degree distributions. *Theoretical Ecology*, **3**:45-52.

Williams, R. J., Anandanadesan, A. & Purves, D. 2010. The probabilistic niche model reveals the niche structure and role of body size in a complex food web. *PLoS ONE*, **5**:e12092.

Smith, M.J., Diaz, H.B., Clemente-Munoz, M. A., Donaldson, J., Hutton, J., McGough, N. H., Morgan, D. H., O'Criodan, C., Oldfield, T. E., Schippmann, U., and Williams, R. J. 2011. Assessing the impacts of international trade on CITES-listed species: current practices and opportunities for scientific research, *Biological Conservation* **144**:82-91.

Thierry, A., A.P. Beckerman, P.H. Warren, R.J. Williams, A.J. Cole, O.L. Petchey. 2011. Adaptive foraging and the rewiring of size-structured food webs following extinctions. *Basic and Applied Ecology*, **12**: 562-570.

Melian, C.J., C. Vilas, F. Baldo, E. González-Ortegón, P. Drake, R.J. Williams. 2011. Eco-evolutionary dynamics of individual-based food webs. *Adv. Ecol. Res* **45**: 225-268

Williams, R. J. 2011. Biology, Methodology or Chance? The Degree Distributions of Bipartite Ecological Networks. *PLoS ONE* **6**:e17645.

Thierry, A., Petchey, O. L., Beckerman, A. P., Warren, P. H., and Williams, R. J.. 2011. The consequences of size dependent foraging for food web topology. *Oikos* **120**:493-502. 493-502.

Joppa L.N. & Williams R. 2011. The influence of single elements on nested community structure. *Methods in Ecology and Evolution*, **2**, 541-549.

Williams R. & Purves D. 2011. The probabilistic niche model reveals substantial variation in the niche structure of empirical food webs. *Ecology*, **92**:1849–1857.

Boit A., Martinez N.D., Williams R.J. & Gaedke U. 2012. Mechanistic theory and modelling of complex food-web dynamics in Lake Constance. *Ecology Letters*, **15**, 594-602.

Kéfi, S, EL Berlow, EA Wieters, SA Navarrete, OL Petchey, SA Wood, A Boit, LN Joppa, KD Lafferty, RJ Williams, ND Martinez, BA Menge, CA Blanchette, AC Iles, U Brose. 2012. More than a meal... integrating non-feeding interactions into food webs. *Ecology Letters*, **15**: 291-300

Marthews, TR, Y Malhi, CAJ Girardin, JE Silva Espejo, LEOC Aragão, DB Metcalfe, JM Rapp, LM Mercado, RA Fisher, DR Galbraith, JB Fisher, N Salinas-Revilla, AD Friend, N Restrepo-Coupe, and RJ Williams. 2012. Simulating forest productivity along a neotropical elevational transect: temperature variation and carbon use efficiency. *Global Change Biology* **18**: 2882-2898.

Joppa, L N and R Williams. 2013. Modeling the Building Blocks of Biodiversity. *PLoS ONE* **8**, e56277 .

Dunne, J.A., Lafferty K.D, Dobson, A.P., Hechinger, R.F., Kuris, A.M., Martinez, N.D., McLaughlin, J.P., Mouritsen, K.N., Poulin, R., Reise, K., Stouffer, D.B., Thielges, D.W., Williams, R.J., Zander C. D. 2013. Parasites Affect Food Web Structure Primarily through Increased Diversity and Complexity. *PLoS Biology*, **11**: e1001579.

Berlow, E.L., R.A. Knapp, S.M. Ostoja, R.J. Williams, H. McKenny, J.R. Matchett, Q. Guo, G. M. Fellers, P. Kleeman, M.L. Brooks, L. Joppa. 2013. A Network Extension of Species Occupancy Models in a Patchy Environment Applied to the Yosemite Toad (*Anaxyrus canorus*). *PLoS ONE*, **8**: e72200.

Yoon, I., G Ng, H Rodrigues, T Nguyen, JH Paik, S Yoon, R Williams, ND Martinez , 2013. Iterative design and development of the ‘World of Balance’ game: From ecosystem education to scientific discovery. *Games Innovation Conference (IGIC), 2013 IEEE International*, 283-290.

Working Papers:

Williams, R.J., and N.D. Martinez. 2001 Stabilization of chaotic and non-permanent food-web dynamics. Santa Fe Institute Working Paper 01-07-037.

Williams, R. J., N. D. Martinez, E. L. Berlow, J. A. Dunne and A-L Barabási. 2001. Two Degrees of Separation in Complex Food Webs. Santa Fe Institute working paper 01-07-036.

Dunne, J.A., R.J. Williams, and N.D. Martinez. 2002. Network structure and biodiversity loss in food webs: Robustness increases with connectance. Santa Fe Institute Working Paper 02-03-13.

Dunne, J. A., R. J. Williams and N. D. Martinez. 2002. Food-web structure and network theory: the role of connectance and size. Santa Fe Institute working paper 02-03-010.

Williams, R.J., and N.D. Martinez. 2004. Diversity, complexity, and persistence in large model ecosystems. Santa Fe Institute Working Paper 04-07-022.

Book Chapters

Dunne, J. A., U. Brose, R. J. Williams, and N. D. Martinez. 2005. Modeling food-web structure and dynamics: Implications for complexity-stability. In: *Aquatic Food Webs: An Ecosystem Approach*. A. Belgrano, U. Scharler, J.A. Dunne, and R.E. Ulanowicz, eds. Oxford University Press.

Harper-Smith, S., E. L. Berlow, R. A. Knapp, R. J. Williams, and N. D. Martinez. 2006. Communicating ecology through food webs: Visualizing and quantifying the effects of stocking alpine lakes with fish. In: P. De Ruiter, J. C. Moore, and V. Wolters, editors. *Dynamic Food Webs: Multispecies assemblages, ecosystem development, and environmental change*. Elsevier/Academic Press.

Martinez, N.D., R.J. Williams, and J.A. Dunne. 2006. Diversity, complexity, and persistence in large model ecosystems. In: *Ecological Networks: Linking Structure to Dynamics in Food Webs*. M Pascual and J. A. Dunne, eds. Santa Fe Institute Studies on the Sciences of Complexity Series, Oxford University Press.

S. Krivov, F. Villa, R. Williams, X.Wu, 2007. On Visualization of OWL Ontologies. In C. Baker and K. Cheung, editors. *Semantic Web: Revolutionizing Knowledge Discovery in the Life Sciences*, Springer.

Williams R. J., Brose U. & Martinez N. D., 2007. Homage to Yodzis and Innes 1992: Scaling up feeding-based population dynamics to complex ecological networks. In: *From Energetics to Ecosystems: The Dynamics and Structure of Ecological Systems* (eds. N. Rooney, K. S. McCann & D. L. G. Noakes) pp. 37-52. Springer.

Other Professional Activities

Smith, M. J., R. J. Williams, and D. W. Purves. Boosting CITES Through Research. 2011. Letter. *Science* **331**:857.

Williams, R. J. and Joppa, L. N. 2010. A simple model of the niche structure of mutualistic networks. Poster, *British Ecological Society Annual Meeting*, Leeds, UK.

Joppa, L. N. and Williams, R. J. 2010. The influence of single elements on a community metric. Talk, *British Ecological Society Annual Meeting*, Leeds, UK.

Kidd, D. M., Orme, D., Mace, G. M., Coulson, T. N., Purvis, A., Owens. I., Knight, S., Freeman, R., Calsyn, M., Hellmich, E., Williams, R. 2009. Entangled Bank: connecting ecological data with a semantic web framework and simple metadata. Poster, *e-Biosphere 2009*, June 1-3.

Yoon, I, Williams, R, Levine, E, Yoon, S, Dunne J and Martinez, N. 3D Visualization of Ecological Networks on the WWW. Poster, *IEEE Visualization 2003*, Seattle, October 19-24.

Erwin, D.H., J.A. Dunne, R.K. Bambach, J.B.C. Jackson, C. Labandeira, N.D. Martinez, A.I. Miller, R.J. Williams, and R.A. Wood. 2003. A new look at paleo-food webs and the evolution of ecosystem structure. *Geological Society of America Annual Meeting*. San Francisco, CA. Abstract.

Martinez, N.D., R.J. Williams, and J.A. Dunne. 2003. Simple rules yield complex food webs. *American Physical Society Annual Meeting*. Austin, TX. Abstract.

Dunne, J.A., R.J., Williams, and N.D. Martinez. 2003. Network structure and the robustness of aquatic food webs to species loss. *ASLO Annual Meeting*. Salt Lake City, UT. Abstract.

Invited participant (2002). Science on the Semantic Web: Building the Next Generation of Environmental Information Systems. Rutgers University, October 24-25.

Three Presentations at Ecological Society of America Annual Mtg. August 2002 in Tucson, AZ.

1. Martinez Neo D. (presented talk) and Richard J. Williams. Biological mechanisms responsible for the network structure of food webs.
2. Dunne, Jennifer A. (presented talk), Richard J. Williams and Neo D. Martinez. Network topology and species loss in food webs: Robustness increases with connectance.
3. Vaccaro, Erin C., Cedric O. Puleston (presented poster), Neo D. Martinez, and Richard J. Williams. Sensitivity and success of the Niche Model at predicting the network structure of extremely large food webs.

Contributing Speaker (2002). Nonlinear network dynamics and stability of complex food webs. Conference on "Distribution, Diversity, and Evolutionary Dynamics", Univ. of Virginia. June 13-16, Charlottesville, VA.

Invited Participant (2002). Santa Fe Institute Working Group. Webs on the Web (WOW): Internet Database, Analysis, and Visualization of Ecological Networks. Co-sponsored by Santa Fe Institute Research Programs in Network Dynamics and Robustness. Santa Fe, NM. April 18-20.

Invited Participant (2002). Santa Fe Institute Working Group. Paleofoodweb Construction and the Evolution of Ecosystem Structure. March 21-23. Santa Fe, NM.

Invited poster co-presenter (2001). National Science Foundation Biocomplexity Awardee Meeting. *Scaling of complexity with diversity*. N.D. Martinez, J.A. Dunne, A.-L. Barabási, R.J. Williams, and E.L. Berlow. October 16-17. Ballston, VA.

Poster and Abstract (2000). Martinez, N. D. and R. J. Williams. Simplicity within Complexity: a simple model successfully predicts food-web complexity. Joint meeting of the British Ecological Society and the Ecological Society of America. Orlando, FL.

Published Abstract (1999). Martinez, N. D. and R. J. Williams. Simplicity within Complexity: a simple model successfully predicts food-web complexity., Annual Meeting of the Ecological Society of America, Spokane, WA.

Awards

1988 PC Magazine Technical Excellence award, development tools category, for Borland International's *Turbo Debugger*.