

Suzanne M. O'Regan

CONTACT INFORMATION	Senior Research Associate, Odum School of Ecology 140 E. Green St. Athens GA 30602 USA	<i>E-mail:</i> smoregan@uga.edu <i>Phone:</i> +1-706-583-5538
RESEARCH INTERESTS	Critical phenomena in epidemiology and ecology; Theoretical ecology; Ecology of infectious diseases; Population dynamics; Computational and mathematical modeling; Global zoonoses; Theory of critical transitions.	
EDUCATION	University College Cork , Cork, Ireland Ph.D., Applied Mathematics, 2011 Title: <i>Elucidating the responses of avian populations to novel pathogens and to relaxation of intraspecific competition: a mathematical modelling approach</i> Advisors: Prof. Alexei V. Pokrovskii (<i>deceased</i>), Dr. Michael J. A. O'Callaghan, Dr. Thomas C. Kelly Examiners: Prof. Leonid Kalachev (University of Montana at Missoula), Prof. Dmitriy Rachinskiy (University of Texas at Dallas) University College Cork , Cork, Ireland B. Sc., Mathematical Sciences, 2007 University of Montana at Missoula , Missoula, Montana, USA International Exchange Student, 2009	
PROFESSIONAL POSITIONS	Senior Research Associate , Odum School of Ecology, University of Georgia, Athens, Georgia, September 2020–Present Assistant Professor , Department of Mathematics and Statistics, North Carolina A&T State University, Greensboro, North Carolina, 2016 – 2020 Postdoctoral Research Fellow , NIMBioS, University of Tennessee, Knoxville, Tennessee, 2015–2016 Postdoctoral Research Associate , Odum School of Ecology, University of Georgia, Athens, Georgia, 2013–2014 PI: Dr. Andrew W. Park Postdoctoral Research Associate , Odum School of Ecology, University of Georgia, Athens, Georgia, 2011–2013 PI: Dr. John M. Drake	

- PUBLICATIONS **O'Regan, S. M.**, O'Dea, E. B., Rohani, P., Drake, J. M. 2020. Transient indicators of tipping points in infectious diseases. Accepted for publication in *Journal of the Royal Society Interface*.
- Han, B. A., **O'Regan, S. M.**, Schmidt, J. P., Drake, J. M. 2020. Integrating data mining and transmission theory in the ecology of infectious diseases. *Ecology Letters* 23(8), 1178–1188.
- Drake, J. M., **O'Regan, S. M.**, Dakos, V., Kefi, S., Rohani, P. Alternative Stable States, Tipping Points, and Early Warning Signals of Ecological Transitions. In K. McCann and G. Gellner, (Eds.) *Theoretical Ecology: Concepts and Applications*, Oxford University Press, 2020.
- Peace, A., **O'Regan, S. M.**, Spatz, J. A., Reilly, P. N., Hill, R. D., Carter, E. D., Wilkes, R. P., Waltzek, T. P., Miller, D. L., Gray, M. J. 2019. A highly invasive chimeric ranavirus can decimate tadpole populations rapidly through multiple transmission pathways. *Ecological Modeling* 410, 108777.
- Drake, J. M., Brett, T. S., Chen, S., Epureanu, B. I., Ferrari, M. J., Marty, E., O'Dea, E. B., **O'Regan, S. M.**, Park, A. W., Rohani, P. 2019. The statistics of epidemic transitions. *PLOS Computational Biology* 15(5), e1006917.
- O'Regan, S. M.**, Burton, D. L. 2018. How stochasticity influences leading indicators of critical transitions. *Bulletin of Mathematical Biology* 80, 1630–1654.
- O'Regan, S. M.** 2018. How noise and coupling influence leading indicators of population extinction in a spatially extended ecological system. *Journal of Biological Dynamics*. 12, 211–241. doi:10.1080/17513758.2017.1339834
- Sims, C., Finnoff, D., **O'Regan, S. M.** 2016. Public control of rational and unpredictable epidemics. *Journal of Economic Behavior and Organization*. 132, 161–176. doi:10.1016/j.jebo.2016.04.005
- O'Regan, S. M.**, Lillie, J. W., Drake, J. M. 2016. Leading indicators of mosquito-borne disease elimination. *Theoretical Ecology*. 9(3), 269–286. doi:10.1007/s12080-015-0285-5
- O'Regan, S. M.**, Vinson, J. E., Park, A. W. 2015. Interspecific contact and competition may affect the strength and direction of disease-diversity relationships for directly transmitted microparasites. *The American Naturalist* 186(4), 480–494.
- Drake J. M., Bakach I., Just, M. R., **O'Regan, S. M.**, Gambhir, M., Fung, I. C-H. 2015. Transmission models of historical Ebola outbreaks. *Emerging Infectious Diseases* 21(8). doi:10.3201/eid2108.141613

O'Regan, S. M., Magori, K., Pulliam, J. T., Zokan, M., Kaul, R. B., Barton, H. D., Drake, J. M. 2015. Multi-scale model of epidemic fadeout: Will local extirpation events inhibit the spread of white-nose syndrome? *Ecological Applications* 25(3), 621–633.

Drake J. M., Kaul, R. B., Alexander, L., **O'Regan, S. M.**, Kramer, A. M., Pulliam, J. T., Ferrari, M. J., Park, A.W. 2015. Ebola cases and health system demand in Liberia. *PLOS Biology* 13(1), e1002056.

O'Regan, S. M., Drake, J. M. Theory of early warning signals of disease emergence and leading indicators of elimination. 2013. *Theoretical Ecology* 6(3), 333–357.

O'Regan, S. M., Kelly, T. C., Korobeinikov, A., O'Callaghan, M. J. A., Pokrovskii, A. V., Rachinskii, D. 2013. Chaos in a seasonally perturbed SIR model: avian influenza in a seabird colony as a paradigm. *Journal of Mathematical Biology* 67, 293–327.

O'Regan, S. M., Flynn D., Kelly, T. C., O'Callaghan, M. J. A., Pokrovskii, A. V., Rachinskii D. 2012. The response of the woodpigeon (*Columba palumbus*) to relaxation of intraspecific competition: A hybrid modelling approach. *Ecological Modelling* 224, 54–64.

O'Regan, S. M., Kelly, T. C., Korobeinikov, A., O'Callaghan, M. J. A., Pokrovskii, A. V., 2010. Lyapunov functions for SIR and SIRS epidemic models. *Applied Mathematics Letters* 23, 446–448.

O'Regan, S. M., 2008. Impact of seasonality upon the dynamics of a novel pathogen in a seabird colony. *Journal of Physics: Conference Series* 138, doi:10.1088/1742-6596/138/1/012017.

O'Regan, S. M., Kelly, T. C., Korobeinikov, A., O'Callaghan, M. J. A., Pokrovskii, A. V., 2008. Qualitative and numerical investigations of the impact of a novel pathogen on a seabird colony. *Journal of Physics: Conference Series* 138, doi:10.1088/1742-6596/138/1/012018.

AWARDS AND GRANTS

National Science Foundation, Division of Human Resource Development. North Carolina A&T ADVANCE Institutional Transformation (IT) Project Course Release Time Award, January 10 2019–May 13 2019. (\$8,184)

National Science Foundation, Research Experiences for Undergraduates (REU) Sites and Supplements Program, 2019–2022. REU Site: North Carolina A&T State University and Elon University Joint Summer REU in Mathematical Biology. PI: Luke, N. Senior personnel: **O'Regan, S. M.** (\$7,594)

North Carolina A&T ADVANCE Institutional Transformation (IT) Project Fellowship, 2018.

National Science Foundation, Ecology and Evolution of Infectious Diseases Program, 2017–2022. Global patterns, predictors, and their dynamical consequences in zoonotic diseases in mammals. PI: Han, B. Co -PIs: **O’Regan, S. M.**, Drake, J. M. (\$281,682)

Mathematical Association of America Project NExT (New Experiences in Teaching) Fellowship, August 2016–July 2017 (\$1,000)

National Institute for Mathematical and Biological Synthesis (NIMBioS) Short-term Visitor Award (NSF Award #DBI-1300426), July 2016. Machine learning and mathematical modeling of pace-of-life in disease ecology.

National Institute for Mathematical and Biological Synthesis (NIMBioS) Postdoctoral Fellowship (NSF Award #DBI-1300426), January 2015–December 2016 (\$108,000)

GRANT
APPLICATIONS
PENDING

National Science Foundation, Improving Undergraduate STEM Education: Education and Human Resources (IUSE: EHR) Program, 2020–2022. Redesigning an Introductory Statistics Course in the Age of Data Science (ISCADS). PI: Mostafa, S. Co-PIs: Chen, M., Elbayoumi, T. M., **O’Regan, S. M.**, Warrack, A. G.

TEACHING
EXPERIENCE

University of Washington Summer Institutes, Seattle, WA

Instructor, Mathematical models of infectious diseases, Annual Summer Institute in Statistics and Modeling in Infectious Diseases (SISMID), July 2020

North Carolina A&T State University, Greensboro, NC

Instructor of record, Introduction to Differential Equations, Fall 2018–2019, Spring 2020

Instructor of record, Introduction to Probability and Statistics, Spring 2018–2020

Instructor of record, Advanced Topics in Applied Mathematics (Graduate independent study), Fall 2018

Instructor of record, Advanced Numerical Methods (Graduate course), Spring 2018

Instructor of record, Calculus II, Fall 2016–2019, Spring 2017

Instructor of record, Precalculus for Engineers and Scientists, Fall 2016

University of Tennessee, Knoxville, TN

Instructor of record, Mathematics for Life Sciences (Calculus), Fall 2015

MENTORING
EXPERIENCE

Michael Umelo, Undergraduate student in Computational Engineering, North Carolina A&T State University (June 2020–Present).

Behavioral predictors of zoonotic diversity in Carnivora.

Mary Czyzewski, Undergraduate student in Mathematics, University of Alabama (May 2020–Present).

Mathematical modeling of SARS-CoV-2: Superspreading and environmental transmission.

Sheridan Payne, Undergraduate student in Mathematics, Bellarmine University (May 2020–Present).

Mathematical modeling of SARS-CoV-2: Superspreading and environmental transmission.

Alana Howell, Undergraduate student in Bioengineering, North Carolina A&T State University (January 2020–May 2020).

Mathematical modeling of the COVID-19 outbreak.

Jazmine Harrison, Undergraduate student in Bioengineering, North Carolina A&T State University (January 2020–May 2020).

Mathematical modeling of blood flow through the heart.

Michael Umelo, Undergraduate student in Computational Engineering, North Carolina A&T State University (May 2019–May 2020).

Comparing SEI and SEIR mathematical models for multi-host Hendra virus dynamics.

Raven Graves, Undergraduate student in Mathematics, North Carolina A&T State University (January 2019–May 2019).

Mathematical modeling of the glucose-insulin system.

Ian Livengood, Undergraduate student in Mathematics, North Carolina A&T State University (January 2019–May 2019).

Exploratory data analysis of zoonotic diseases in mammal hosts.

A'Marah Hawkins, Undergraduate student in Mathematics, North Carolina A&T State University (January 2017–May 2017).

Dynamics of an emerging multi-host pathogen in amphibians.

Danielle Burton, Graduate student in Mathematics, University of Tennessee (March 2015–Present).

Leading indicators of bifurcations in one-dimensional ecological systems.

Jonathan Lillie, North Hall High School, Gainesville, GA. Teacher Intern, Georgia Intern-Fellowships for Teachers (GIFT) program (Summer 2013).

Leading indicators of elimination in malaria transmission models.

SELECTED
PRESENTATIONS

Umelo, M., **O'Regan, S. M.** Comparing SEI and SEIR mathematical models for multi-host Hendra virus dynamics. 2020 Emerging Researchers National (ERN) Conference in STEM, Washington D. C. February 6–8 2020. Student oral presentation.

O'Regan, S. M. Theory of early warning indicators of critical transitions in

ecological systems, Systems Biology Theory Lunch, Harvard University, May 17, 2019. Invited oral presentation.

O'Regan, S. M. Early warning signals of critical transitions: New theoretical directions. Biomathematics Seminar, North Carolina State University, October 9, 2018. Invited oral presentation.

O'Regan, S. M. Early warning signals: news from the theoretical frontier. Annual Meeting of the Ecological Society of America, New Orleans, U.S.A., August 6-11, 2018. Invited oral presentation.

O'Regan, S. M. How noise affects early warning signals of tipping points in ecological systems. SIAM-SEAS Annual Meeting Minisymposium on Applied Dynamical Systems and Tipping Points, 42nd SIAM Southeastern Section Conference, University of North Carolina at Chapel Hill, U.S.A., March 9–11, 2018. Oral presentation.

O'Regan, S. M. Anticipating tipping points in infectious disease dynamics. Mathematical Biosciences Institute Socioepidemiology Workshop, The Ohio State University, March 5–9, 2018. Invited oral presentation.

O'Regan, S. M. Anticipating population extinction in ecological and epidemiological systems. Wake Forest University, October 5, 2017. Invited oral presentation.

O'Regan, S. M., Burton, D. L. How stochasticity type influences leading indicators of critical transitions. Annual Meeting of the Ecological Society of America, Portland, U.S.A., August 6-11, 2017. Oral presentation.

O'Regan, S. M. Tipping points in epidemics. MAA MathFest, Chicago, IL U.S.A., July 26-29, 2017. Oral presentation.

O'Regan, S. M. Leading indicators of extinction in a spatially extended ecological system. The Society for Mathematical Biology Annual Meeting and Conference, Salt Lake City, UT U.S.A., July 17-20, 2017. Oral presentation.

O'Regan, S. M., Lillie, J. W., Drake J. M. Leading Indicators for Anticipating Elimination of Mosquito-Borne Diseases. Modeling Transmission Dynamics, Vector-Host Ecologies for Controlling Tropical Vector-Borne Infectious Diseases Minisymposium, Annual Meeting of the Society for Industrial and Applied Mathematics, Pittsburgh, PA, U.S.A., July 10-14, 2017. Invited oral presentation.

O'Regan, S. M., Burton, D. L. Leading indicators of bifurcations in ecological systems. 2017 Joint Mathematics Meetings, Atlanta, U.S.A., January 3-7, 2017. Oral presentation.

O'Regan, S. M., Vinson, J. E., Park, A. W. A mathematical framework for understanding the effects of ecological interactions on disease transmission in multi-host communities. Multi-scale epidemics: integrating data from multiple

processes II Minisymposium, Annual Meeting of the Society for Industrial and Applied Mathematics, Boston, MA, U.S.A., July 11-15, 2016. Invited oral presentation.

O'Regan, S. M., Lillie, J. W., Drake J. M. Leading indicators of mosquito-borne disease elimination. Recent perspectives on mathematical epidemiology I Minisymposium, European Conference on Mathematical and Theoretical Biology and Society for Mathematical Biology Annual Meeting, Nottingham, U.K., July 11-15, 2016. Invited oral presentation.

O'Regan, S. M. Anticipating bifurcations in infectious disease dynamics. University of Florida, February 15, 2016. Invited oral presentation.

O'Regan, S. M., Drake J. M. Leading indicators of bifurcations in epidemiological systems. AMS Special Session on Recent Advances in Dynamical Systems and Mathematical Biology, 2016 Joint Mathematics Meetings, Seattle, U.S.A., January 6-9, 2016. Invited oral presentation.

O'Regan, S. M. Anticipating critical transitions in infectious diseases. Modern Math Workshop at the 2015 SACNAS National Conference, Washington D.C. Metropolitan Area, U.S.A., October 28-29, 2015. Invited oral presentation.

O'Regan, S. M., Vinson J. E., Park A. W. A mechanistic basis for the disease-diversity relationship for directly transmitted microparasites. Annual Meeting of the Ecological Society of America, Sacramento, U.S.A., August 10-15, 2014. Oral presentation.

O'Regan, S. M., Magori, K., Pulliam, J. T., Zokan, M., Kaul, R. B., Barton, H. D., Drake, J. M. Multi-scale model of epidemic fadeout: Will local extirpation along geographic corridors inhibit the spread of White-nose Syndrome? AMS Special Session on Mathematical Modeling of the Within- and Between-Host Dynamics of Infectious Diseases, American Mathematical Society Southeastern Spring Sectional Meeting, University of Tennessee, Knoxville, Tennessee, March 21-23, 2014. Invited oral presentation.

O'Regan, S. M., Early warning signals of critical transitions in infectious disease dynamics. Mathematics Colloquium, University of Texas at Dallas, January 31, 2014. Invited oral presentation.

O'Regan, S. M., Drake, J. M. Early warning signals of disease emergence and leading indicators of elimination. Annual Meeting of the Ecological Society of America, Minneapolis, U.S.A., August 4-9, 2013. Oral presentation.

O'Regan, S. M., Magori, K., Pulliam, J. T., Zokan, M., Kaul, R. B., Barton, H. D., Drake, J. M. Stochastic fadeout in space: Will microscale disease induced mortality along geographic corridors inhibit the macro-scale spread of White-nose Syndrome? Annual Meeting of the Ecological Society of America, Portland, U.S.A., August 4-9, 2012. Oral presentation.

COLLABORATIVE RESEARCH ACTIVITIES	<p>National Science Foundation Advancing Theory in Ecology Workshop, Pennsylvania State University, October 22-25, 2019. Identifying key areas in contemporary ecology in need of advanced theory, and establishing new collaborations among theoreticians. Organizers: Alan Hastings, Katriona Shea, Saran Twombly. Invited participant.</p> <p>National Institute for Mathematical and Biological Synthesis (NIMBioS) Working Group: Leptospirosis Modeling, 2015–2016. Mathematical modeling of leptospira transmission and intervention strategies. Organizers: Claudia Munoz-Zanzi, Jorge Valasco-Hernandez. Invited participant.</p>
JOURNAL REVIEWS	<p>Acta Ethologica (1); Advances in Difference Equations (1); American Naturalist (2); Applied Mathematics Letters (1); Bulletin of Mathematical Biology (3); Ecology (2); Ecology and Evolution (1); Ecology Letters (2); Ecosphere (1); Journal of Mathematical Biology (1); Journal of Theoretical Biology (2); Mathematical Biosciences and Engineering (2); Nature Scientific Reports (1); Oikos (1); Philosophical Transactions of the Royal Society B (2); PLOS One (1); Theoretical Ecology (5); Theoretical Population Biology (1).</p>
GRANT PROPOSAL REVIEWS	<p>Engineering and Physical Sciences Research Council (EPSRC) New Investigator Award.</p>
PROFESSIONAL MEMBERSHIPS	<p>Ecological Society of America; Society for Mathematical Biology; European Society for Mathematical and Theoretical Biology; Society for Industrial and Applied Mathematics; Mathematical Association of America.</p>
SELECTED PROFESSIONAL DEVELOPMENT ACTIVITIES	<p>2018 STEM Women’s Writing Retreat, NC A&T ADVANCE Institutional Transformation (IT) Project Workshop, Graylyn Conference Center, Winston-Salem, June 25–29 2018.</p> <p>Faculty Development Workshop on Undergraduate Research Mentoring, The 12th Annual UNCG Regional Mathematics and Statistics Conference, November 11-12, 2016, Greensboro, NC.</p> <p>MAA Project NExT (New Experiences in Teaching) Faculty Development Workshops, August 2016–July 2017.</p>
SELECTED SERVICE ACTIVITIES	<p>Co-chair, College of Science and Technology Seminar Series and Event Planning Committee, North Carolina A&T State University, 2018–2020.</p> <p>Member, Assistant/Associate Professor of Mathematics (Computational Mathematics) Faculty Search Committee, Department of Mathematics, North Carolina A&T State University, 2017–2018.</p>

Member, Graduate Student Project Defense Committee, Department of Mathematics, North Carolina A&T State University, 2017–2018.
Michelle Bundy. *Mathematical Modeling of Vaccination Techniques to Prevent a Ebola Outbreak*.

Co-organizer, SIAM-SEAS Annual Meeting Minisymposium on *Applied Dynamical Systems and Tipping Points*, 42nd SIAM Southeastern Section Conference, University of North Carolina at Chapel Hill, U.S.A., March 9–11, 2018.

Academic Advisor, Department of Mathematics and Statistics, North Carolina A&T State University, Fall 2017–Present.

Presentation judge, Theoretical Ecology Section Vito Volterra Awards for Best Student Presentation, Ecological Society of America Annual Meeting, August 2013–2014, 2017–2018.

Co-organizer, MAA Project NExT Panel Discussion on *The Research and Teaching Pendulum: Finding a Stable Equilibrium*, 2017 AMS-MAA Joint Mathematics Meetings, Atlanta, U.S.A., January 3–7, 2017.

REFERENCES

Suzanne Lenhart

Professor,
Department of Mathematics,
University of Tennessee,
Knoxville, TN 37996 USA
Email: slenhart@tennessee.edu
Phone: +1 865 974 9349

Andrew W. Park

Associate Professor,
Odum School of Ecology,
140 E. Green St.,
Athens GA 30602-2202, USA
Email: awpark@uga.edu
Phone: +1 706 542 4819

A. Giles Warrack

Associate Professor,
Department of Mathematics and Statistics,
Marteena Hall,
1601 East Market Street,
Greensboro, NC 27411, USA
Email: warrack@ncat.edu
Phone: +1 336 285 2092

Dmitriy Rachinskiy

Professor,
Department of Mathematical Sciences,
University of Texas at Dallas,
800 W. Campbell Road,
Richardson, Texas 75080 USA
Email: dmitry.rachinskiy@utdallas.edu
Phone: +1 972 883 6697

John M. Drake

Distinguished Research Professor,
Odum School of Ecology,
140 E. Green St.,
Athens GA 30602-2202, USA
Email: jdrake@uga.edu
Phone: +1 706 818 4452