

# RAFAEL PEÑA-MILLER

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## EDUCATION

- 2007-2011 **PhD Mathematics**  
Department of Mathematics, Imperial College London, supervised by Robert Beardmore.
- 1999-2005 **BSc Mathematics**  
Faculty of Sciences, UNAM. Thesis supervised by Pablo Padilla.

## POST-DOCTORAL RESEARCH

- 2014-present **Center for Genomic Sciences, UNAM**  
Assistant Professor in Systems Biology
- 2013-2014 **Department of Zoology, University of Oxford**  
Post-doctoral Research Associate
- 2011-2013 **Biosciences, University of Exeter**  
Post-doctoral Research Fellow

## HONORS AND AWARDS

- 2015 **Newton Advanced Fellowship**  
Awarded by The Royal Society
- 2014 **Member of the National System of Researchers (Level 1)**  
CONACYT – Mexico
- 2013 **Lee Segel Prize**  
Awarded by the Society of Mathematical Biology to the best paper published
- 2012 **Merit Award**  
University of Exeter
- 2011 **Bicentennial Award for Excellence in Postgraduate Research**  
Awarded by the Secretary for Public Education - Mexico
- 2010 **IDEA League Fellowship**  
ETH-Zurich
- 2007-2011 **Scholarship for Graduate Studies**  
CONACYT - Mexico

## PEER-REVIEWED PUBLICATIONS

### **17. Evaluating the effect of horizontal transmission on the stability of plasmids under different selection regimes**

*R. Peña-Miller, R Rodríguez, C. MacLean and A. San Millan*  
Mobile Genetic Elements, Vol. 5, No. 3 (2015).

### **16. Using a sequential regimen to eliminate bacteria at sub-lethal antibiotic dosages**

*A. Fuentes-Hernandez, J. Plucain, F. Gori, R. Peña-Miller, C. Reding, G. Jansen, H. Schulenburg, I. Gudelj and R. Beardmore*  
PLoS Biology, Vol. 12, No. 8 (2015).

### **15. Positive selection and compensatory adaptation interact to stabilize non-transmissible plasmids**

*A. San Millan, R. Peña-Miller, M. Toll-Riera, Z. Halbert, A. McLean, B. Cooper and C. MacLean*  
Nature Communications, Vol. 5, No. 5208 (2014).

- 14. Bistable expression of virulence genes in Salmonella leads to the formation of an antibiotic-tolerant subpopulation**  
*M. Arnoldini, I. Avalos Vizcarra, R. Peña-Miller, N. Stocker, M. Diard, V. Vogel, R. Beardmore, W.-D. Hardt and M. Ackermann*  
PLoS Biology, Vol 12, No. 8 (2014).
- 13. Testing the optimality properties of a dual antibiotic treatment in a two-locus, two-allele model**  
*R. Peña-Miller, A. Fuentes-Hernandez, C. Reding, I. Gudelj and R. Beardmore*  
Journal of the Royal Society Interface, Vol 11, No. 96 (2014).
- 12. Genomics of rapid adaptation to antibiotics: convergent evolution and scalable sequence amplification**  
*D. Lähnemann, R. Peña-Miller, P. Rosenthal, R. Beardmore G. Jansen and H. Schulenburg.*  
Genome Biology and Evolution, evu106 (2014).
- 11. When the most potent combination of antibiotics selects for the greatest bacterial load: the smile frown transition.**  
*R. Peña-Miller, Lähnemann, Jansen, Fuentes-Hernandez, Rosenthal, Schulemburg and Beardmore.*  
PloS Biology, 11(4): e1001540 (2013).
- 10. The optimal deployment of synergistic antibiotics: a control-theoretic approach.**  
*R. Peña-Miller, D. Lähnemann, H. Schulemburg, M. Ackermann and R. Beardmore*  
Royal Society Interface, Vol 9, No. 75 pp. 2488-502 (2012) .
- 9. Strömgren uvby- $\beta$  photoelectric photometry of variable stars RU PSC, SS PSC and TU UMa**  
JH Peña, R Figuera Jaimes, M Chow, *R. Peña-Miller*, M. Alavarez.  
Revista Mexicana de Astronomía y Astrofísica, vol 48, No. 2, pp. 299–303, (2012).
- 8. Selecting against antibiotic-resistant pathogens: optimal treatments in the presence of commensal bacteria.**  
*R. Peña-Miller, D. Lähnemann, H. Schulemburg, M. Ackermann and R. Beardmore*  
Bulletin of Mathematical Biology, Vol 74, No. 4 pp. 908-943 (2011).
- 7. Single-cell time-lapse analysis of depletion of the universally conserved essential protein YgjD.**  
*T. Bergmiller, R. Pena-Miller, A. Boehm and M. Ackermann.*  
BMC Microbiology, Vol 11, No. 118 (2011).
- 6. Antibiotic cycling versus mixing: the difficulty of using mathematical models to definitively quantify their relative merits.**  
*R. Beardmore and R. Peña-Miller*  
Mathematical Biosciences and Engineering, Vol 7, No. 4 pp. 923-933 (2010).
- 5. Rotating antibiotics selects optimally against antibiotic resistance, in theory.**  
*R. Beardmore and R. Peña-Miller*  
Mathematical Biosciences and Engineering, Vol 7, No. 3 pp. 527-552 (2010).
- 4. Modelling cognitive decline in the Hypertension in the Very Elderly Trial [HYVET] and proposed risk tables for population use.**  
*R. Peters, N. Beckett, R. Beardmore, R. Peña-Miller, K. Rockwood, A. Mitnitski, A. Fletcher, C. Bulpitt*  
PLoS ONE 5(7): e11775 (2010)
- 3. uvby- $\beta$  photoelectric photometry of Cepheid stars.**  
*J. H. Peña, A. Arellano-Ferro, R. Peña-Miller, M. Alavarez, Y. Rosas, H. Garcia, G. Muñoz, B. Vargas, J.P. Sareyan, C.A. Guerrero and A. Rentería.*  
RevMexAA, vol 46, No. 2, pp. 291–308, (2010).
- 2. Physical Parameters of seven field RR Lyrae stars in Bootes**  
*J.H. Peña, A. Arellano Ferro, R. Peña Miller, J.P. Sareyan and M. Alvarez*  
RevMexAA, vol 45, No. 2, pp. 191-204, (2009).
- 1. D115520, a new  $\delta$  Scuti Star.**  
*J. H Peña, J. P Sareyan, B. Cervantes-Sodi, R. Peña-Miller, M. Álvarez, M. Cano y M. Sorcia*  
RevMexAA vol. 43, No. 1, pp. 217-224 (2007)

## PRESENTATIONS

[Invited course] *Mathematical Methods in Biology Summer School*, Morelia, Mexico, August 2015.  
[Invited talk] *Cooperation and Complexity*, Facultad de Ciencias, UNAM, Mexico, April 2015.  
[Poster] *International Society for Evolution, Medicine & Public Health Meeting*, Tempe, USA, March 2015.  
[Invited talk] *Health and Complex Systems Symposium*, UACM, Mexico, February 2015.  
[Invited course] *XVI Autumn School in Mathematical Biology*, Juriquilla, Mexico, October 2014.  
[Invited talk] *Mexican Mathematical Society Meeting*, Durango, Mexico, October 2014.  
[Contributed talk] *Society for Molecular Biology and Evolution*, San Juan, Puerto Rico, June 2014.  
[Invited talk] *National Institute of Public Health*, Mexico, April 2014.  
[Plenary speaker] *Society of Mathematical Biology – Annual Meeting and Conference*, USA, June 2013.  
[Invited talk] *Mathematical Congress of the Americas*, CIMAT, Mexico, August 2013.  
[Invited talk] *Image Processing Workshop*, Exeter Imaging Network, UK, March 2013.  
[Contributed talk] *Multiscale Modelling in Medicine and Biology*, Nottingham, UK, September 2012.  
[Invited talk] *Antibiotic-Resistant Infections Workshop*, University of Miami, USA, December 2011.  
[Invited talk] *Mathematics in Emerging Disease Management*, CIC, Mexico, January 2011.  
[Contributed talk] *North American Meeting on Industrial and Applied Maths*, Mexico, December 2010.  
[Invited talk] University of Kiel, Germany, September 2010.  
[Invited talk] ETH-Zurich, Switzerland, November 2009.  
[Poster] *Evolution of Stress Responses*, University of Aberdeen, September 2009.  
[Poster] *12th Congress of the European Society for Evolutionary Biology*, Turin, Italy, August 2009.  
[Poster] *BICS Conference: Multiply Structured Populations in Biology*, University of Bath, July 2009.  
[Poster] *Evolution of Antimicrobial Resistance Workshop*, Imperial College London, January 2009.

## CONFERENCES AND COURSES ATTENDED

**1<sup>st</sup> International Summer Symposium on Systems Biology** (INMEGEN, Mexico City, August 2014).  
**European iGEM Jamboree** (Amsterdam, Netherlands, October 2012).  
**Short read genomics: Remapping** (Exeter Academy, Biosciences, March-June 2012).  
**3<sup>rd</sup> Workshop in Theoretical Biology** (Max Planck Institute, Plön, Germany, February 2011).  
**Evolution of Microbial Cooperation** (University of Bath, UK, January 2011).  
**Autumn Symposium on Systems and Synthetic Biology** (Imperial College, November 2010).  
**Theoretical and Empirical Population Genetics** (Max-Planck Institute, Germany, September 2010).  
**Summer School: The Physics of Evolution** (UCSD, USA, August 2010).  
**SMIDDY: Swiss Meeting for Infectious Disease Dynamics** (Bern, Switzerland, May 2010).  
**Symposium in Evolutionary Biology** (Institute of Integrative Biology, ETH-Zurich, May 2010).  
**Coevolution: Models and Microbial Model Systems** (University of Liverpool, UK, April 2010).  
**Host-parasite Co-evolution Workshop** (Kiel, Germany, February 2010).  
**Mathematical Models, Microbes & Evolution Meeting** (NESCent, USA, July 2009).  
**Bifurcation-Theoretic Computations for Density Functional Theory** (Madrid, Spain, April 2009).  
**1st Elgersburg School on Mathematical Systems Theory** (TU Ilmenau, Germany, April 2009).  
**Evolution of Stochastic Gene Expression Workshop** (University of Liverpool, UK, December 2007).  
**International Genetically Engineered Machine Competition** (MIT, USA, November 2006).  
**Summer School on Systems Biology Dynamics** (McGill, Canada, July 2006).  
**V Autumn School in Mathematical Biology** (UAZ, Mexico, November 2003).

## ACADEMIC ACTIVITIES

**The Systems Biology of Drug Resistance Evolution** (Workshop co-organiser, May 2014).  
**Exeter Imaging Network** (*Co-ordinator, 2011-2012*)  
**Quantitative Evolutionary Dynamics Workshop** (*Co-organiser, April 2013*)  
**iGEM: The international Genetically Engineered Machine competition** (*Instructor, 2012*)  
**Mathematics of Microbes: Biological Details of the Evolving Cell** (*Workshop co-organiser, April 2011*)  
**Mathematical Models and Experimental Microbial Systems** (*Administrative support, 2009-2011*)  
**Journal of the European Optical Society: Rapid Publications** (IT Manager, 2007-2010)

## TEACHING

**Systems Biology** (Undergraduate Program in Genomic Sciences, UNAM, 2015).  
**Multivariate Statistics** (Undergraduate Program in Genomic Sciences, UNAM, 2015).  
**Introduction to Statistics** (Undergraduate Program in Genomic Sciences, UNAM, 2014).  
**Multivariate Statistics** (Undergraduate Program in Genomic Sciences, UNAM, 2014).