

# Pablo Catalán

Ramón Areces Postdoctoral Fellow  
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## Education

- 2017:** PhD in Mathematical Engineering  
Carlos III University of Madrid (UC3M) || Graduated *cum laude*, awarded extraordinary prize  
*Thesis:* Models in molecular evolution: the case of  $t_{cy}$ LIFE
- 2017:** BSc in Mathematics (4-year degree)  
National Distance Education University (UNED) || GPA: 9.5 (out of 10)  
Studied simultaneously with PhD
- 2012:** MSc in Modelling and Physics of Complex Systems  
King Juan Carlos I University of Madrid (URJC) || GPA: 9.75 (out of 10)  
*Thesis:* Mutation-selection equilibrium in finite populations playing a Hawk-Dove game
- 2011:** BSc+MSc in Biology (5-year degree)  
Complutense University of Madrid (UCM) || GPA: 9.74 (out of 10) (Graduated with honors)

## Work Experience

- Sep 2018—present:** Postdoctoral researcher  
Biosciences, University of Exeter  
Research topic: Mathematical models in antibiotic resistance  
**Supervisor:** Prof. Robert Beardmore
- Apr 2017—Jul 2018:** Postdoctoral researcher  
Department of Mathematics, Carlos III University of Madrid  
Research topic: Models in molecular evolution  
**Supervisor:** Prof. José A. Cuesta
- Mar 2016—May 2016:** Visiting researcher  
Biosciences, University of Exeter  
Research topic: Mathematical models in antibiotic resistance  
**Supervisor:** Prof. Robert Beardmore
- Mar 2015—Jul 2015:** Visiting researcher  
Institute of Evolutionary Biology and Environmental Studies, University of Zurich  
Research topic: Models in molecular evolution  
**Supervisor:** Prof. Andreas Wagner
- Dec 2012—Feb 2017:** FPI Predoctoral Fellow  
Department of Mathematics, Carlos III University of Madrid  
Research topic: Models in molecular evolution  
**Supervisor:** Prof. José A. Cuesta

**Oct 2008—Jun 2011:** Assistant researcher (undergraduate)  
Department of Ecology, Complutense University of Madrid  
Research topic: Reproductive allocation strategies in *Cistus ladanifer*  
**Supervisor:** Dr. Juan Antonio Delgado

## Awards

**Oct 2018** Ramón Areces Postdoctoral Fellowship: 1 year fellowship to carry out research at the University of Exeter (22 awarded that year by the Ramón Areces Foundation).

**Jan 2018** Best poster award at the 6th meeting of the Spanish Society for Evolutionary Biology (Palma de Mallorca, Spain).

**Mar 2016** Short-Term Fellowship for a 60 days visit to Robert Beardmore's lab, University of Exeter (awarded by the Spanish Ministry of Economy).

**Mar 2015** Short-Term Fellowship for a 120 days visit to Andreas Wagner's lab, University of Zurich (awarded by EMBO)

**Dec 2012** FPI PhD Fellowship: 4 year fellowship to carry out a PhD at Carlos III University (awarded by the Spanish Ministry of Economy).

**Sep 2010** Assistant scholarship: 1 year fellowship to collaborate in research as an undergraduate (awarded by Complutense University of Madrid).

**Sep 2009** Excellency scholarship: 1 year fellowship to collaborate in research as an undergraduate (awarded by the Regional Government of Madrid).

**Sep 2008** Excellency scholarship: 1 year fellowship to collaborate in research as an undergraduate (awarded by the Regional Government of Madrid).

## Teaching

**2015-2016, 2017-2018:** Linear Algebra (problems)  
One semester course, taught to first year students in the Degree in Industrial Technology Engineering at Carlos III University of Madrid

## Languages

**English:** Full professional proficiency (C2).

**French:** Elementary proficiency (A2).

## Publications

11. CATALÁN, P., Elena, S. F., Cuesta, J. A. and Manrubia, S. **2019** Parsimonious Scenario for the Emergence of Viroid-Like Replicons De Novo. *Viruses* **11**:425.
10. García-Martín, J.A., CATALÁN, P., Manrubia, S. and Cuesta, J. A. **2018**. Statistical theory of phenotype abundance distributions: a test through exact enumeration of genotype spaces. *Europhysics Letters* **123**:2800.
9. Aguirre, J., CATALÁN, P., Cuesta, J. A. and Manrubia, S. **2018**. On the networked architecture of genotype spaces and its critical effects on molecular evolution. *Open Biology* **8**:180069.

8. CATALÁN, P., Wagner, A., Manrubia, S. and Cuesta, J. A. **2018**. Adding levels of complexity enhances robustness and evolvability in a multi-level genotype-phenotype map. *Journal of the Royal Society Interface* **15**:20170516.
7. CATALÁN, P., Arias, C.F., Cuesta, J. A. and Manrubia, S. **2017**. Adaptive multiscapes: an up-to-date metaphor to visualize molecular adaptation. *Biology Direct* **12**:7.
6. CATALÁN, P., Delgado, J.A., Jiménez, M.D. and Balaguer, L. **2016**. Sink strength manipulation in branches of a Mediterranean woody plant suggests sink-driven allocation of biomass in fruits but not of nutrients in seeds. *Acta Physiologiae Plantarum* **38**:193.
5. Planchuelo, G., CATALÁN, P. and Delgado, J.A. **2016**. Gone with the wind and the stream: Dispersal in the invasive species *Ailanthus altissima*. *Acta Oecologica* **73**:31-37.
4. Planchuelo, G., CATALÁN, P., Delgado, J.A. and Murciano A. **2016**. Estimating wind dispersal potential in *Ailanthus altissima*: The need to consider the three-dimensional structure of samaras. *Plant Biosystems*, **151**:316-322.
3. CATALÁN, P., Seoane, J.M. and Sanjuán, M.A.F. **2015**. Mutation-selection equilibrium in finite populations playing a Hawk-Dove game. *Communications in Nonlinear Science and Numerical Simulations* **25**:66-73.
2. Arias, C.F., CATALÁN, P., Manrubia, S.M. and Cuesta, J.A. **2014**.  $\tau_{\text{OY}}$ LIFE: a computational framework to study the multi-level organization of the genotype-phenotype map. *Scientific Reports* **4**: 7549.
1. CATALÁN, P., Vázquez de Aldana, B.R., De las Heras, P., Fernández-Seral, A. and Pérez-Corona, M.E. **2013**. Comparing the allelopathic potential of exotic and native plant species on understory plants: are exotic plants better armed? *Anales de Biología* **35**: 65-74.

## Conference contributions

### Talks

8. CATALÁN, P. **2019**. Phenotypic bias and evolutionary predictability in a pattern-formation genotype-phenotype map. **CECAM Workshop: From sequences to functions: challenges in the computation of realistic genotype-phenotype maps**. March 13-15 2019, Zaragoza (Spain) (invited talk).
7. CATALÁN, P. **2019**. Phenotypic bias and evolutionary predictability in a pattern-formation genotype-phenotype map. **Colloquium on Predictability and Programmability in Biology**. February 11 2019, Madrid (Spain) (invited talk).
6. CATALÁN, P. **2019**. Modelling the evolution of antibiotic resistance in *Escherichia coli*. **XV GISC Workshop**, January 11 2019, Madrid (Spain).
5. CATALÁN, P., Manrubia, S. and Cuesta, J.A. **2018**. Non-Markovian jumping times and evolutionary irreversibility in a computational genotype-phenotype map. **XXII Congreso de Física Estadística (FISES '18)**. October 18-20 2018, Madrid (Spain).
4. CATALÁN, P. **2016**.  $\tau_{\text{OY}}$ LIFE, or the importance of being promiscuous. **International Workshop on Genotype-Phenotype Maps 2016 (IWGP 2016)**. September 8-9 2016, Cambridge (UK) (invited talk).
3. CATALÁN, P. **2015**.  $\tau_{\text{OY}}$ LIFE: the complexities of the genotype-phenotype map. **Modelling Biological Evolution 2015 (MBE '15)**, April 28-May 1 2015, Leicester (UK) (invited talk).
2. CATALÁN, P. **2014**.  $\tau_{\text{OY}}$ LIFE: a toy Universe for gaining insight into biological evolution. **XI GISC Workshop**, February 7 2014, Madrid (Spain).
1. CATALÁN, P., Fernández-Arias, C. and Cuesta, J. A. **2013**.  $\tau_{\text{OY}}$ LIFE: a toy Universe for gaining insight into evolution. **4th SESBE Meeting**. November 27-29 2013, Barcelona (Spain).

## Posters

8. CATALÁN, P., Nieto, C., Prat, S. and Ares, S. **2018**. A non-linear model to explain how plants integrate light and temperature to decide how much to grow. **XXII Congreso de Física Estadística (FISES '18). October 18-20th 2018, Madrid (Spain).**
7. CATALÁN, P., Manrubia, S. and Cuesta, J. A. **2018**. Adding levels of complexity enhances robustness and evolvability in a multi-level genotype-phenotype map. **6th SESBE Meeting. January 17-19th 2018, Palma de Mallorca (Spain).**
6. CATALÁN, P., Manrubia, S. and Cuesta, J. A. **2017**. The evolution of pattern formation in  $\text{toyLIFE}$ , a multi-level model of the genotype-phenotype map. **EMBO Conference Quantitative Principles in Biology. 2-4 Noviembre 2017. Heidelberg (Germany).**
5. CATALÁN, P., Manrubia, S. and Cuesta, J. A. **2017**. Evolutionary dynamics on shifting environments suggest new antibiotic therapies. **Gordon Research Conference: Molecular Mechanisms in Evolution. June 11-17th 2017, Easton (USA).**
4. CATALÁN, P., Fernández-Arias, C. and Cuesta, J. A. **2014**.  $\text{toyLIFE}$ : un universo de juguete para comprender mejor la evolución. **XIX Congreso de Física Estadística (FISES '14). April 2-4th 2014, Ourense (Spain).**
3. CATALÁN, P., Jiménez, M.D., Delgado, J.A. and Balaguer, L. **2011**. Variation in sink strength affects size-mediated competition within the crown. **12 th EEf Congress. September 25-29th 2011, Ávila (Spain).**
2. Pérez-Corona, M.E., CATALÁN, P., Fernández-Seral, A., De las Heras, P., Castro-Díez, P. and Vázquez de Aldana, B.R. **2011**. Effect of riverine invasive species in germination and radicle growth of under-story species. **12 th EEf Congress. September 25-29th 2011, Ávila (Spain).**
1. Pérez-Borrero, B., CATALÁN, P., Aguilar, E.Y., Fontecha, G., Trabanino, R., Gallego, F.J., Figueiras, A.M. and Benito, C. **2010**. Identificación con diferentes marcadores moleculares de cepas de *Beauveria bassiana* utilizadas en la lucha biológica contra la broca del café (*Hypothenemus hampei*). **XII Congreso Internacional de manejo integrado de plagas / XX reunión anual de la Sociedad americana de fitopatología (APS-CD). August 24-27th 2010, Managua (Nicaragua).**