

# Dr. Sandra Palau Calderón

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## Current Position

Associated Researcher C at Instituto de de Investigaciones en Matemáticas Aplicadas y en Sistemas at UNAM.

## Research Interests

Probability theory, Stochastic processes, Branching processes and superprocesses, Random environment, Self-similar Markov processes, Stochastic Systems with interacting components, Lévy processes, Markov Additive Processes, Stochastic differential equations.

## Education

<b>Universidad Nacional Autónoma de México (UNAM)</b> <i>B. Sc., Mathematics</i> Second best academic performance in my graduating class, 9.87 out of 10	<b>México City, México</b> 2005–2010
<b>UNAM</b> <i>M. Sc., Mathematics</i> Best academic performance in my graduating class, 10 out of 10, Qualifying exams in Analysis, Algebra and Topology with honors in Analysis	<b>México City, México</b> 2010–2012
<b>Centro de Investigación en Matemáticas (CIMAT)</b> <i>Ph. D., Probability and Statistics</i> <b>Title:</b> <i>Generalisations of continuous state branching processes</i> <b>Advisors:</b> Dr. Juan Carlos Pardo Millán and Prof. Andreas Kyprianou	<b>Guanajuato, México</b> 2012–2016

## Awards

<b>Science and Technology National Council (CONACyT)</b> <i>Graduate Scholarship for Master Degree</i>	<b>México</b> 2010– 2012
<b>CONACyT</b> <i>Graduate Scholarship for Ph.D. Degree</i>	<b>México</b> 2012– 2016
<b>Royal Society</b> <i>Newton International Fellowship</i>	<b>U.K.</b> 2017– 2018
<b>National System of Researchers from CONACyT</b> <i>Candidate to National Researcher</i>	<b>México</b> 2017– 2019

## Publications

- Refereed journal publications.....
- Asymptotic behaviour of exponential functionals of Lévy processes with applications to random processes in random environment. **S. Palau**, J.C. Pardo, and C. Smadi. ALEA, Lat. Am. J. Probab. Math. Stat. 13 (2016), no. 2, 1235–1258.
  - Continuous state branching processes in random environment: The Brownian case. **S. Palau**, and J.C. Pardo. Stochastic Processes and their Applications, 127 (2016), no. 3, 957-994.

3. Branching processes in a Lévy random environment. **S. Palau**, and J.C. Pardo. Acta Appl. Math. 153 (2018), 55–79.
4. Extinction properties of multi-type continuous-state branching processes. A. Kyprianou, and **S. Palau**. Stochastic Processes and their Applications, November 2017, DOI: 10.1016/j.spa.2017.11.006
5. Almost sure growth of supercritical multi-type continuous-state branching process. A. Kyprianou, **S. Palau**, and Y-X Ren. ALEA, Lat. Am. J. Probab. Math. Stat. 15 (2018), 409–428.
6. A note on characterizing tightness of random sets of càdlàg paths. N. Freeman, and **S. Palau**. To appear in Lecture Notes Series, Institute for Mathematical Sciences, National University of Singapore.

### Submitted.....

1. Almost sure,  $L^1$ - and  $L^2$ -growth behavior of supercritical multi-type continuous state and continuous time branching processes with immigration. M. Barczy, **S. Palau**, and G. Pap. (2018), arXiv preprint: 1803.10176
2. Asymptotic behavior of projections of supercritical multi-type continuous state and continuous time branching processes with immigration. M. Barczy, **S. Palau**, and G. Pap. (2018), arXiv preprint: 1806.10559
3. Backbone decomposition of multitype superprocesses. D. Fekete, **S. Palau**, J.C. Pardo, and J.L. Pérez. (2018), arXiv preprint: 1803.09620
4. Law of large numbers for supercritical superprocesses with non-local branching. **S. Palau**, T. Yang. (2018), arXiv preprint: 1806.02044

## Experience

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### Teaching.....

<b>I/2009:</b> UNAM, Bachelor program	<i>Teacher assistant of Calculus I</i>
<b>II/2009:</b> UNAM, Bachelor program	<i>Teacher assistant of Calculus II</i>
<b>I/2010:</b> UNAM, Bachelor program	<i>Teacher assistant of Calculus III</i>
<b>II/2010:</b> UNAM, Bachelor program	<i>Teacher assistant of Calculus IV</i>
<b>I/2011:</b> UNAM, Bachelor program	<i>Teacher assistant of Calculus I</i>
<b>II/2011:</b> UNAM, Bachelor program	<i>Teacher assistant of Calculus II</i>
<b>II/2011:</b> UNAM, Bachelor program	<i>Teacher of Topology I</i>
<b>II/2012:</b> CIMAT, Master program	<i>Teacher assistant of Advanced Probability</i>
<b>I/2013:</b> CIMAT, Master program	<i>Teacher assistant of Stochastic Calculus</i>
<b>July 2013:</b> CIMAT	<i>Teacher assistant for X workshop in Calculus problems (Students from different Universities)</i>
<b>July 2014:</b> CIMAT	<i>Teacher assistant for XI workshop in Calculus problems</i>
<b>I/2015:</b> CIMAT, Master program	<i>Teacher assistant of Stochastic Calculus</i>

### Selected presentations.....

- 2014:** *Haar Measure*. Interinstitutional Seminar on Random Matrices, CIMAT, México
- 2014:** *Continuous state branching processes in a Brownian random environment*. XIII Latin American Congress of Probability and Mathematical Statistics. Cartagena, Colombia
- 2015:** *Branching processes in a Brownian random environment*. 38<sup>th</sup> Conference on Stochastic Processes and their Applications. Oxford University. U.K.
- 2015:** *Branching processes with an infinite number of types*. Probability and Stochastic Processes Seminar, UNAM, México
- 2015:** *Stochastic differential equations with jumps applied to branching processes*. Probabilistic Models in Biology. Playa del Carmen, México

- 2015:** *Non-negative solution of SDE's with jumps. XII Symposium of Probability and Stochastic Processes.* Merida, México
- 2016:** *Multi-type continuous state branching processes.* World congress in probability and Statistics. Toronto, Canada
- 2016:** *Branching processes in a Lévy random environment.* Summer School on Lévy Processes. Lille, France
- 2016:** *Multi-type continuous state branching processes.* Stochastic and Deterministic Models for Evolutionary Biology. CMO, Oaxaca, México
- 2017:** *Continuous state branching processes with immigration in random environment.* 3<sup>rd</sup> Workshop on Branching Processes and Related Topics. Beijing Normal University, China
- 2017:** *Continuous-state branching processes in random environment.* Invited speaker in the session Recent developments in continuous-state branching processes at the 39<sup>th</sup> Conference on Stochastic Processes and their Applications. Moscow, Russia
- 2017:** *The Brownian web and Brownian net.* Genealogies of Interacting Particle Systems. National University of Singapore, Singapore
- 2017:** *Extinction properties and asymptotic behaviour of multi-type continuous state branching processes.* Stochastic Seminar at Peking University. Beijing, China
- 2017:** *The Brownian web and Brownian net.* Branching processes and related topics. Bath-UNAM-CIMAT workshop IX. Guanajuato, México.
- 2018:** *Extinction properties and asymptotic behaviour of multi-type continuous state branching processes.* Stochastic Seminar at University of Szeged. Szeged, Hungary
- 2018:** *Backbone and Spine decomposition for multi-type branching processes.* UK Easter Probability Meeting 2018. Sheffield, UK
- 2018:** *Decompositions for multi-type continuous-state branching processes.* Branching Structure: The fifth Bath-Beijing-Paris Meeting. Beijing, China

**Attended conferences/workshops.....**

- 2012:** Random Matrices School, CIMAT, México
- 2013:** 2<sup>nd</sup> Workshop on Risk Analysis in Economics and Finance, CIMAT, México
- 2013:** VII Probability and Stochastic Processes Summer School, UNAM, México
- 2014:** 3<sup>rd</sup> Meeting Royal Spanish Mathematical Society and Mexican Mathematical Society. Zacatecas, México
- 2015:** Zürich Spring School on Lévy Processes. Zurich, Switzerland
- 2015:** Probability and Biological Evolution. CIRM, Marseille, France
- 2016:** 8<sup>th</sup> International Conference on Lévy Processes. Angers, France
- 2017:** Multi-Scale Features of Selection in Population Genetics. Eindhoven, The Netherlands

**Academic visits.....**

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| <b>Prof. Andreas Kyprianou</b>   | <b>University of Bath, UK</b>           |
| <i>Project: Multi-type continuous-state branching processes</i>                              | <i>Oct, 2014-Aug, 2015</i>              |
| <b>Prof. Anita Winter</b>  | <b>University of Essen, Germany</b>     |
| <i>Project: Evolving phylogenies of two-level mutation-selection systems</i>                 | <i>Jan, 2017</i>                        |
| <b>Prof. Yanxia Ren</b>  | <b>Peking University, China</b>         |
| <i>Project: Strong law of large number for multi-type continuous state branching process</i> | <i>Nov, 2016</i>                        |
| <b>Prof. Zenghu Li</b>   | <b>Beijing Normal University, China</b> |
| <i>Project: Branching processes in random environment</i>                                    | <i>May, 2017</i>                        |

<b>Prof. Yanxia Ren</b> <i>Project: Yaglom Theorem for critical multi-type continuous state branching process</i>	<b>Peking University, China</b> <i>Oct, 2017</i>
<b>Dr. Nic Freeman</b> <i>Project: Lévy webs</i>	<b>University of Sheffield, UK</b> <i>Nov, 2017</i>
<b>Dr. Matyas Barczy and Dr. Gyula Pap</b> <i>Project: Multi-type continuous state branching process</i>	<b>University of Szeged, Hungary</b> <i>Mar. and May, 2018</i>
<b>Dr. Charline Smadi</b> <i>Project: Wright-Fisher diffusions in random environment</i>	<b>IRSTEA, France</b> <i>April, 2018</i>

### Miscellaneous.....

- 2<sup>nd</sup> SAMBa Integrative Think Tank (ITT). June 2015 Bath, U.K. (workshops in which academic, industrial, and other external partners present problems requiring research solutions) Problem: Stochastic analysis of the neutron transport equation and an application to nuclear reaction.
- 5<sup>th</sup> SAMBa ITT. January 2017. Bath, U.K. Problem: Modelling a granular flow in a rotating drum.
- 6<sup>th</sup> SAMBa ITT. June 2017. Bath, U.K. Problem: Modelling of bubble size distribution by a fragmentation-coagulation process.
- 7<sup>th</sup> SAMBa ITT. January 2018. Bath, U.K. Problem: Modelling flow of polluted water through porous medium.
- 8<sup>th</sup> SAMBa ITT. June 2018. Bath, U.K. Problem: Modelling the spread of MRSA.
- Reviewer for the journals: Electronic Communications in Probability(2), Electronic Journal of Probability(1), ESAIM: Probability and Statistics(1), Statistics and Probability Letters(1), Science China Mathematics(1), Stochastics: An International Journal Of Probability And Stochastic Processes(1), Stochastic Processes and their Applications(4).

## References

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**Dr. Juan Carlos Pardo Millán**  
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