

## **Dr Arnau Montagud**

Institut Curie, Paris, France

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## **EDUCATION**

Ph.D., *Cum Laude* with distinctions, Department of Applied Mathematics, Universitat Politècnica de València, 17 April 2012

M.Sc., Cellular Biology, Universitat de València, 10 October 2007

B.Sc., Biology, Universitat de València, 24 July 2006

## **RESEARCH EXPERIENCE**

*Postdoctoral researcher, January 2014 – present*

U900, Institut Curie, Paris, France

Principal Investigator: Dr. Emmanuel Barillot

I have been involved in projects with three different types of cancer: breast, medulloblastoma and prostate cancer. I have studied these using four different approaches:

- I used data deconvolution to discover new relevant signatures;
- I used pathway enrichment tools to better describe group patients;
- I built Boolean models, published pipelines and tools to better capture patients' diversity and drug predictions; and
- I co-authored a multiscale modelling framework that combines agent-based and Boolean modelling.

*Postdoctoral researcher, May 2012 – January 2014*

Institut Universitari de Matemàtica Pura y Aplicada, Universitat Politècnica de València, València, Spain

Principal Investigator: Prof. Javier F Urchueguía

I worked on the use of multi-objective optimizations on flux balance analysis and on models of the scaling-up of the production of hydrogen in *Synechocystis* sp. PCC6803.

I mentored 5 M.Sc. and 2 Ph.D. students.

*Ph.D. student, April 2007 – April 2012*

Institut Universitari de Matemàtica Pura y Aplicada, Universitat Politècnica de València, València, Spain

Advisors: Pedro Fernández de Córdoba (UPV), Kiran R Patil (EMBL) and Javier F Urchueguía (UPV)

I built the first genome-scale metabolic model of *Synechocystis* sp. PCC6803 and I used flux balance analysis to simulate for the first time a single metabolic network under different growth conditions, with completely different flux landscapes. I also proposed several mutants that would enhance the cyanobacterium's potentialities as a production platform. Lastly, I studied the transcriptomics of metabolic changes upon light regime changes.

*Ph.D. visiting student at Kiran Raosaheb Patil (DTU) group*

September 2008 – January 2009 and March 2010 – September 2010, Technical University of Denmark (DTU), Kongens Lyngby, Denmark

*Ph.D. visiting student at Kiran Raosaheb Patil (EMBL) group*

September 2010 – February 2011 at EMBL, Heidelberg, Germany

*MSc student, September 2006 – October 2007*

Universitat de València, València, Spain

Advisors: Pedro Fernández de Córdoba (UPV), Jesús Salgado (UV) and Javier F Urchueguía (UPV)

For my MSc thesis and in the context of an FP6-funded project consortium, I characterized two promoters (pLac and pOmpR) and I helped standardize an expression plasmid in *Synechocystis* sp. PCC6803 that different members of the consortium used later.

*MSc visiting student at Peter Lindblad (UU) group*

April 2007 – June 2007, Uppsala University, Uppsala, Sweden

## TRAINING:

Technical: molecular cloning; cyanobacterium growth; shell, R and python coding (basic & advanced); basics on cluster computing

Transversal: grant writing; interviewing skills; presentations techniques

## AWARDS AND HONOURS

2013 – Selected for the programme “Pioneers into Practice” from the EU-funded “Climate KIC”

2013 – Ph.D. thesis with distinctions award, selected as one of the top 50 Ph.D. theses of that year, UPV

2011 – 2<sup>nd</sup> Price in 5th Valencia IDEA competition in Energy and Environment, Valencia City Council

2011 – Travel grant to attend Synthetic Biology 5.0 in Stanford, USA

2008 – Travel grant to attend Synthetic Biology 4.0 in Hong Kong, China

2007 – Ph.D. fellowship awarded by the Regional Government of Valencia

## PUBLICATIONS (CITATIONS BY SCOPUS EXCLUDING SELF-CITATIONS)

1. Antoine Forget, [...], **Arnau Montagud**, et al. (2018): *Aberrant ERBB4-SRC Signaling as a Hallmark of Group 4 Medulloblastoma Revealed by Integrative Phosphoproteomic Profiling*. *Cancer Cell*, 34: 379-395.e7. doi:10.1016/j.ccell.2018.08.002
2. Gaëlle Letort, **Arnau Montagud**, et al. (2018): *PhysiBoSS: a multi-scale agent based modelling framework integrating physical dimension and cell signalling*. *Bioinformatics*, bty766.
3. Jonas Béal, **Arnau Montagud**, et al. (2018): *Instantiation of patient-specific logical models with multi-omics data allows clinical stratification of patients*. Under revision in *Frontiers in Physiology*
4. **Arnau Montagud**, et al. (2017): *Pipeline of logical modelling tools facilitates experimental testing and conclusions*. *Briefings in Bioinformatics*, bbx163.
5. Filipe Pinto, [...], **Arnau Montagud**, et al. (2015): *Improving a Synechocystis-based photoautotrophic chassis through systematic genome mapping and validation of neutral sites*. *DNA Research*, 22 (6): 425-437. **Citations: 10**
6. **Arnau Montagud**, et al. (2015): *Synechocystis sp. PCC6803 metabolic models for the enhanced production of biofuels*. *Critical Reviews in Biotechnology* 22 (6): 425-437. DOI:10.3109/07388551.2013.829799. **Citations: 3**
7. Daniel Gamermann, **Arnau Montagud**, et al. (2014): *New approach for phylogenetic tree recovery based on genome-scale metabolic networks*. *Journal of Computational Biology*, 21 (7): 508-19. **Citations: 2**
8. R.A. Jaime-Infante, [...], **Arnau Montagud**, et al. (2014): *Herramienta para la optimización de flujos metabólicos en un sistema biológico*. *Investigación Operacional*, 35 (2): 96-103.
9. Julián Triana, **Arnau Montagud**, et al. (2014): *Generation and evaluation of a genome-scale metabolic network model of Synechococcus elongatus PCC7942*. *Metabolites*, 4 (3): 680-698.
10. Daniel Gamermann, **Arnau Montagud**, et al. (2014). *PyNetMet: Python tools for efficient work with networks and metabolic models*. *Computational and Mathematical Biology*, 3:(5). ISSN: 2219-1402. iConcept Press.
11. Daniel Gamermann, **Arnau Montagud**, et al. (2012): *A modular synthetic device to calibrate promoters*. *Journal of Biological Systems*, 20 (1):37.
12. Miguel Lopo, **Arnau Montagud**, et al. (2012): *Experimental and modelling analysis of Synechocystis sp. PCC6803 growth*. *Journal Molecular Microbiology and Biotechnology*, 22 (2):71-82. **Citations: 6**
13. Raymari Reyes, Daniel Gamermann, **Arnau Montagud**, et al. (2012): *Automation on the Generation of Genome-scale Metabolic Models*. *Journal of computational biology: a journal of computational molecular cell biology*, 19:1295–306. **Citations: 7**
14. Filipe Pinto, [...], **Arnau Montagud**, et al. (2012): *Construction of a chassis for hydrogen production: physiological and molecular characterization of a Synechocystis sp. PCC6803 mutant lacking a functional bidirectional hydrogenase*. *Microbiology (Reading, England)*, 158:448-464. **Citations: 18**
15. **Arnau Montagud**, et al. (2011): *Flux coupling and transcriptional regulation within the metabolic network of the photosynthetic bacterium Synechocystis sp. PCC6803*. *Biotechnology Journal*, 6:330-342. **Citations: 34**

16. Raymari Reyes, [...], **Arnau Montagud**, et al. (2011): *Desarrollo De Una Plataforma Computacional Para El Modelado Metabólico De Un Microorganismo*, *Nereis*, 3:25–31. **Citations: 1**
  17. Eugeni Belda, [...], **Arnau Montagud**, et al. (2011): *Microbial Diversity in the Midguts of Field and Lab-Reared Populations of the European Corn Borer Ostrinia nubilalis*. *PLoS ONE*, 6:e21751. **Citations: 29**
  18. Cristina Vilanova, [...], **Arnau Montagud**, et al. (2011): *Aequorin-expressing yeast emits light under electric control*. *Journal of Biotechnology*, 152:93-5. **Citations: 2**
  19. **Arnau Montagud**, et al. (2010): *Reconstruction and analysis of genome-scale metabolic model of a photosynthetic bacterium*. *BMC Systems Biology*, 4:156. **Citations: 70**
  20. Joaquina Delás, [...], **Arnau Montagud**, et al. (2009): *Yeast cultures with UCP1 uncoupling activity as a heating device*. *New Biotechnology*, 26:300-6. **Citations: 2**
  21. Emilio Navarro, **Arnau Montagud**, et al. (2009): *Metabolic flux analysis of the hydrogen production potential in Synechocystis sp. PCC6803*. *International Journal of Hydrogen Energy*, 34:8828-8838 **Citations: 27**
  22. Guillermo Rodrigo\*, **Arnau Montagud\***, et al. (2007): *Vanillin cell sensor*. *IET Synthetic Biology*, 1:74. **Citations: 2**
- \* equal contributions

## EDUCATIONAL PUBLICATIONS

1. Montagud, Arnau (2014): *Presente y futuro de los modelos matemáticos en la lucha contra el cáncer*. <http://dx.doi.org/10.6084/m9.figshare.1207974>.
2. Pitarch, Miguel, **Arnau Montagud**, Emilio Navarro, Pedro Fernández de Córdoba, Javier F Urchueguía (2010). *iGEM: una experiencia educativa única de trabajo en grupos multidisciplinares en el campo de la biología*. *Revista de la Facultad de Educación*, 17:57. ISSN 1657-6454
3. Pitarch, Miguel, Cristina Vilanova, Angeles Hueso, Carles Palanca, Guillem Marco, Eduardo Otero, **Arnau Montagud**, et al (2010): *El equipo Valencia-iGEM diseña y construye la primera pantalla biológica*. *Matemática*, 6 (3), september. ISSN 1699-7700

## PUBLISHED BOOKS

1. **Montagud, Arnau** (2012): *Modelling and analysis of biological systems to obtain biofuels*. Saarbrücken, Germany: Lambert Academic Publishing. ISBN: 978-3-659-36415-0.
2. **Montagud, Arnau**, Emilio Navarro, Pedro Fernández de Córdoba, and Javier F Urchueguía (2009): *Introduction to Synthetic Biology*. Valencia, Spain: PoliCLICK. ISBN: 978-84-691-5074-0.
3. Palanca, Carles, Juny Crespo, Cristina Vilanova, Guillem Marco, Sara Rivera, Angeles Hueso, Miguel Pitarch, Eduardo Otero, Jerzy Szablowski, **Arnau Montagud**, Emilio Navarro, Manuel Porcar (2009): *Sins, Ethics and Biology*. <http://dx.doi.org/10.6084/m9.figshare.1206372>.

## REVIEWER

BMC Systems Biology, PLoS ONE, Scientific Reports, Frontiers in Physiology. [Link to Publons profile](#).

## MENTORSHIP

1. Maria Siurana (2017), Ph.D. thesis: *Multiobjective optimization of cyanobacterial metabolic models*. Mathematics Graduate School, UPV. Supervised by Pedro Fernández de Córdoba, Gilberto Reynoso-Meza and **Arnau Montagud**.
2. Julián Triana (2014), Ph.D. thesis: *Model-based analysis and metabolic design of a cyanobacterium for bio-products synthesis*. Mathematics Graduate School, UPV. Supervised by Pedro Fernández de Córdoba, Javier F Urchueguía and **Arnau Montagud**.
3. **Mentoring of M.Sc. students:** Maria Siurana, Julián Triana, R.A. Jaime-Infante, Raymari Reyes, Jorge Garrido

## TALKS

- “Patient-specific prostate logical models allow clinical stratification of patients and personalized drug treatment”, **selected talk** at *Workshop on Logical Modelling of Cellular Networks* at ECCB 2018: 17<sup>th</sup> European Conference On Computational Biology, Athens, Greece, 8 September, 2018
- “From genes to pathways: pathway quantification with ROMA”, seminar at *GENOPOLE SUMMER SCHOOL 2018: Bioinformatics and Biostatistical tools in medical genomics*, Genopole, Château’form Seine-Port, France, 29 June 2018
- “rROMA, a tool for module activity calculation from omics data and networks”, tutorial at *3<sup>rd</sup> Disease Maps Community Meeting*, Institut Curie, Paris, France, 22 June 2018
- “Towards patient-specific multi-scale models and data integration for clinical stratification”, seminar at Computational Biology group, BSC, Barcelona, Spain, 19 June 2018
- “Use of computational methods for logical modelling of biological networks”, **invited talks** at *In Silico Systems Biology Training*, EBI, Hinxton, UK, 3 to 8 June 2018
- “Instantiation of patient-specific logical prostate models with multi-omics data allows clinical stratification of patients”, **selected talk** at *3<sup>rd</sup> European Conference on Translational Bioinformatics*, PRBB, Barcelona, Spain, 17 April 2018
- “Systems Biology of Cancer or How I learned to stop worrying and love the complexity”, seminar at Mathematics Graduate School, UPV, València, Spain, 29 September 2017
- “Conceptual and computational framework for logical modelling of biological networks deregulated in diseases”, **invited talk** at CoLoMoTo bi-annual meeting, ENS, Paris, France, 17 July 2017
- “Use of computational methods for logical modelling of biological networks deregulated in diseases”, **invited talks** at *3<sup>rd</sup> Porto Meeting in Mathematics and Biology*, Porto, Portugal, 21 and 22 June 2017
- “Modelling and data analyses in Systems Biology of Cancer”, **invited talk** at Institut Universitari de Matemàtica Pura i Aplicada, UPV, València, Spain, 28 March 2017
- “ICA uncovers clinical traits that cause breast cancer stratification”, **selected talk** at *1st Systems biology of Transcription Regulation Workshop* at *17th International Conference on Systems Biology (ICSB)*, Barcelona, Spain, 15 September 2016
- “Modelling intratumoral heterogeneity with multi-scale models”, seminar at INRIA, Paris, France, 27 June 2016
- “Analyse moléculaire de la progression tumorale des carcinomes canalaire in situ du sein”, **invited talk** at *Séminaire de recherche translationnelle*, Institut Curie, Paris, France, 6 October 2015
- “INVADE – Multiscale mathematical modelling of tumour invasion”, **invited talk** at *ABCday*, Institut Curie, Paris, France, 15 May 2015
- “Modelling tumour invasion”, seminar at Institut Pasteur, Paris, France, 2 April 2015
- “Modelling tumour invasion”, **invited talk** at Center for Research and Interdisciplinarity’s FdV Doctoral School, Paris, France, 9 April 2015
- “Use of mathematical models in cancer research”, seminar at CNAM, Paris, France, 10 June 2014

## ORGANISATION OF INTERNATIONAL CONFERENCES

Co-organiser of *2<sup>nd</sup> Systems biology of Transcription Regulation Workshop* at *18th International Conference on Systems Biology (ICSB)*, Lyon, France, 27th October 2018.

## PARTICIPATION WITH POSTER PRESENTATIONS IN INTERNATIONAL CONFERENCES

2018: ECTB’18, Barcelona, Spain; ECCB’18, Athens, Greece (poster accepted)

2017: ISMB ECCB’17, Prague, Czech Republic

2016: Applied bioinformatics in life sciences, Leuven, Belgium; XIII Symposium on Bioinformatics, València, Spain; ICSB’16, Barcelona, Spain

2015: ISMB ECCB’15, Dublin, Ireland; CRCLyon, Lyon, France; ICSB’15, Singapore, Singapore

2014: ECCB’14, Strasbourg, France

2011: SB5.0, Stanford, USA; ICSB’11, Heidelberg, Germany

2010: H2ase 2010, Uppsala, Sweden; Industrial Systems Biology, Gothemburg, Sweden

2009: 2<sup>nd</sup> European Conference on Synthetic Biology, Sant Feliu de Guixols, Spain

2008: IEA meeting, Porto, Portugal; SB4.0, Hong Kong, China;  
2007: 1<sup>st</sup> European Conference on Synthetic Biology, Sant Feliu de Guixols, Spain

## **PARTICIPATION IN COMPETITIVE PROJECTS**

1. PrECISE (Personalized Engine for Cancer Integrative Study and Evaluation)  
PI: Dr. J. Sáez-Rodríguez; PI Institut Curie group: Dr. L. Calzone, **Arnau Montagud (acting IC PI)**  
Funding: H2020 EU; Duration: January 2015 to December 2018
2. M5 (Multi-scale modelling of molecular mechanisms in medulloblastoma)  
PI: Dr. O. Ayrault; PI Institut Curie group: Dr. E. Barillot  
Funding: AVIESAN, Institut National du Cancer; Duration: December 2015 to December 2017
3. INVADE (Multiscale mathematical modelling of tumour invasion)  
PI: Dr. E. Barillot  
Funding: ITMO Cancer 2012; Duration: November 2013 to November 2016
4. CyanoFactory (Design, construction and demonstration of solar biofuel production using novel (photo)synthetic cell factories)  
PI: Prof. P. Lindblad; PI UPV group: Prof. J. Urchueguía  
Funding: FP7 EU; Duration: December 2012 to December 2015
5. Integración de Bases de Datos Biológicas con Nuevas Herramientas de Cómputo en Biología Sintética Orientadas a la Producción de Biocombustibles.  
PI: Prof. P. Fernández de Córdoba  
Funding: Min de Ciencia e Innovación, España; Duration: January 2010 to December 2012
6. Computational Assisted Modelling of Synechocystis PCC6803 Growth in order to Produce a Chassis for Hydrogen Production  
PI: Prof. J. F. Urchueguía  
Funding: Min de Ciencia, España; Duration: January 2009 to December 2010
7. Desarrollo de nuevas tecnologías ómicas y su aplicación en la biosíntesis de etanol  
PI: Prof. P. Fernández de Córdoba  
Funding: PROFIT, Min de Ciencia e Innovación; Duration: January 2008 to December 2009
8. TARPOL (Targeting environmental pollution with engineered microbial systems á la carte)  
PI: Prof. A. Moya; PI UPV group: Prof. J. Urchueguía  
Funding: FP7 EU; Duration: January 2008 to December 2010
9. BIOMODULARH2 (Engineered Modular Bacterial Photoproduction of Hydrogen)  
PI: Dr. A. Jaramillo; PI UPV group: Prof. P. Fernández de Córdoba and Prof. J. Urchueguía  
Funding: NEST PATHFINDER Programme, FP6 EU; Duration: January 2007 to December 2009

## **TECHNOLOGICAL RESULTS**

Logical modelling pipeline with tutorials, [Docker container](https://github.com/sysbio-curie/Logical_modelling_pipeline) and descriptions of tools present in Montagud *et al.* (2017) *Briefings in Bioinformatics*: [https://github.com/sysbio-curie/Logical\\_modelling\\_pipeline](https://github.com/sysbio-curie/Logical_modelling_pipeline)  
PhysiBoSS code examples and analyses scripts: <https://github.com/sysbio-curie/PhysiBoSS>  
Tools to characterize a Boolean model with patient's data present in Béal *et al.* (2018) *in press at Frontiers in Physiology*: [https://github.com/sysbio-curie/Instantiation\\_logical\\_models](https://github.com/sysbio-curie/Instantiation_logical_models)

## **EXTRACURRICULAR ACTIVITIES**

2015 – present, Postdocs' representative at U900 council governing body  
2007 – 2013, advisor member of Valencia's iGEM team, international Synthetic Biology competition  
2006, student member of Valencia's iGEM team

## **LANGUAGES**

Catalan – Native; Spanish – Native; English – Proficient; French – Proficient