

# Arnald Puy

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Updated: July 1, 2023

## Current position

2022 Sep– **Associate Professor in Social and Environmental Uncertainties**  
School of Geography, Earth and Environmental Sciences; College of Life and Environmental Sciences, University of Birmingham, UK  
[UoB webpage](#)

## Previous positions

2019–2022 **Marie Skłodowska-Curie Fellow (GF)**  
Dept. of Ecology and Evolutionary Biology, Princeton University, USA  
Centre for the Study of the Sciences and the Humanities, University of Bergen, Norway

2018–2019 **Researcher**  
Centre de Recherches en Archéologie et Patrimoine, Université Libre de Bruxelles, Belgium

2015–2017 **Marie Curie Fellow (IEF)**  
Maritime Civilizations Department, University of Haifa, Israel

2014–2015 **Humboldt Research Fellow**  
Institute of Geography, University of Cologne, Germany

2012–2014 **Postdoctoral Researcher**  
Complexity and Social-Ecological Dynamics (CaSEs), Institució Milà i Fontanals, CSIC Barcelona. Spain

2008–2012 **Predoctoral Fellow (FPI)**  
Dept. de Ciències de l'Antiguitat i l'Edat Mitjana, Facultat de Filosofia i Lletres, Universitat Autònoma de Barcelona, Spain

## Education

2012 **PhD in Antiquity and Middle Ages**  
Universitat Autònoma de Barcelona, Spain  
DISSERTATION TITLE: Construction criteria of Andalusí irrigated fields. The case of Ricote (Murcia, Spain)  
<https://www.tdx.cat/handle/10803/96879?locale-attribute=en>  
GRADE: *Summa cum laude*

2009 **DEA in Medieval and Classical History and Archaeology**  
Universitat Autònoma de Barcelona, Spain

2006 **BA in History**

## Publications

### Peer reviewed papers

1. **Arnald Puy**, Michela Massimi, Bruce Lankford, and Andrea Saltelli. “Irrigation modelling needs better epistemology”. *Nature Reviews Earth & Environment* (2023). DOI: [10.1038/s43017-023-00459-0](https://doi.org/10.1038/s43017-023-00459-0).
2. Andrea Saltelli and **Arnald Puy**. “What can mathematical modelling contribute to a sociology of quantification?” *Humanities & Social Sciences Communications* 10 (2023), p. 213. DOI: [10.1057/s41599-023-01704-z](https://doi.org/10.1057/s41599-023-01704-z).
3. Andrea Saltelli, Marta Kuc-Czarnecka, Samuele Lo Piano, Máté János Lőrincz, Magdalena Olczyk, **Arnald Puy**, Erik Reinert, Stefán Thor Smith, and Jeroen van der Sluijs. “Impact assessment culture in the European Union. Time for something new?” *Environmental Science and Policy* 142 (2023), pp. 99–111. DOI: [10.1016/j.envsci.2023.02.005](https://doi.org/10.1016/j.envsci.2023.02.005).
4. Monica Di Fiore, Marta Kuc Czarnecka, Samuele Lo Piano, **Arnald Puy**, and Andrea Saltelli. “The challenge of quantification: an interdisciplinary reading”. *Minerva* 61 (2022), pp. 53–70. DOI: [10.1007/s11024-022-09481-w](https://doi.org/10.1007/s11024-022-09481-w).
5. Samuele Lo Piano, Razi Sheikholeslami, **Arnald Puy**, and Andrea Saltelli. “Unpacking the modelling process via sensitivity auditing”. *Futures* 144 (2022), p. 103041. DOI: [10.1016/j.futures.2022.103041](https://doi.org/10.1016/j.futures.2022.103041).
6. **Arnald Puy**, Pierfrancesco Beneventano, Simon A. Levin, Samuele Lo Piano, Tommaso Portaluri, and Andrea Saltelli. “Models with higher effective dimensions tend to produce more uncertain estimates”. *Science Advances* 8.42 (2022), eabn9450. DOI: [10.1126/sciadv.abn9450](https://doi.org/10.1126/sciadv.abn9450). [R code](#).
7. **Arnald Puy**, Razi Sheikholeslami, Hoshin V. Gupta, Jim W. Hall, Bruce Lankford, Samuele Lo Piano, Jonas Meier, Florian Pappenberger, Amilcare Porporato, Giulia Vico, and Andrea Saltelli. “The delusive accuracy of global irrigation water withdrawal estimates”. *Nature Communications* 13 (2022), p. 3183. DOI: [10.1038/s41467-022-30731-8](https://doi.org/10.1038/s41467-022-30731-8). [R code](#).
8. Samuele Lo Piano, Emanuele Borgonovo, **Arnald Puy**, Andrea Saltelli, John Walsh, and Daniele Vidoni. “Improving the reliability of cohesion policy databases”. *PLOS ONE* 17.4 (2022), e0266823. DOI: [10.1371/journal.pone.0266823](https://doi.org/10.1371/journal.pone.0266823).
9. **Arnald Puy**, Bruce Lankford, Jonas Meier, Saskia van der Kooij, and Andrea Saltelli. “Large variations in global irrigation withdrawals caused by uncertain irrigation efficiencies”. *Environmental Research Letters* 17.4 (2022), p. 044014. DOI: [10.1088/1748-9326/ac5768](https://doi.org/10.1088/1748-9326/ac5768). [R code](#).
10. **Arnald Puy**, Samuele Lo Piano, Andrea Saltelli, and Simon A. Levin. “sensobol: an R package to compute variance-based sensitivity indices”. *Journal of Statistical Software* 102.5 (2022), pp. 1–37. DOI: [10.18637/jss.v102.i05](https://doi.org/10.18637/jss.v102.i05).
11. **Arnald Puy**, William Becker, Samuele Lo Piano, and Andrea Saltelli. “A comprehensive comparison of total-order estimators for global sensitivity analysis”. *International Journal for Uncertainty Quantification* 12.2 (2022), pp. 1–18. DOI: [10.1615/Int.J.UncertaintyQuantification.2021038133](https://doi.org/10.1615/Int.J.UncertaintyQuantification.2021038133). [R code](#).
12. **Arnald Puy**, Emanuele Borgonovo, Samuele Lo Piano, Simon A. Levin, and Andrea Saltelli. “Irrigated areas drive irrigation water withdrawals”. *Nature Communications* 12.1 (2021), p. 4525. DOI: [10.1038/s41467-021-24508-8](https://doi.org/10.1038/s41467-021-24508-8). [R code](#).
13. **Arnald Puy**, Samuele Lo Piano, and Andrea Saltelli. “Is VARS more intuitive and efficient than Sobol’ indices?” *Environmental Modelling & Software* 137 (2021), p. 104960. DOI: [10.1016/j.envsoft.2021.104960](https://doi.org/10.1016/j.envsoft.2021.104960). [R code](#).
14. Saman Razavi, Anthony Jakeman, Andrea Saltelli, Clémentine Prieur, Bertrand Iooss, Emanuele Borgonovo, Elmar Plischke, Samuele Lo Piano, Takuya Iwanaga, William Becker, Stefano Tarantola, Joseph H.A. Guillaume, John Jakeman, Hoshin Gupta, Nicola Melillo, Giovanni Rabitti, Vincent Chabridon, Qingyun Duan, Xifu Sun, Stefán Smith, Razi Sheikholeslami, Nasim Hosseini, Masoud Asadzadeh, **Arnald Puy**, Sergei

- Kucherenko, and Holger R. Maier. “The future of sensitivity analysis: an essential discipline for systems modeling and policy support”. *Environmental Modelling & Software* 137 (2021), p. 104954. DOI: [10.1016/j.envsoft.2020.104954](https://doi.org/10.1016/j.envsoft.2020.104954).
15. Samuele Lo Piano, Federico Ferretti, **Arnald Puy**, Daniel Albrecht, and Andrea Saltelli. “Variance-based sensitivity analysis: The quest for better estimators and designs between explorativity and economy”. *Reliability Engineering & System Safety* 206 (2021), p. 107300. DOI: [10.1016/j.res.s.2020.107300](https://doi.org/10.1016/j.res.s.2020.107300).
  16. Andrea Saltelli, Gabriele Bammer, Isabelle Bruno, Erica Charters, Monica Di Fiore, Emmanuel Didier, Wendy Nelson Espeland, John Kay, Samuele Lo Piano, Deborah Mayo, Roger Pielke Jr, Tommaso Portaluri, Theodore M Porter, **Arnald Puy**, Ismael Rafols, Jerome R Ravetz, Erik Reinert, Daniel Sarewitz, Philip B Stark, Andrew Stirling, Jeroen van der Sluijs, and Paolo Vineis. “Five ways to ensure that models serve society: a manifesto”. *Nature* 582.7813 (2020), pp. 482–484. DOI: [10.1038/d41586-020-01812-9](https://doi.org/10.1038/d41586-020-01812-9).
  17. **Arnald Puy**, Samuele Lo Piano, and Andrea Saltelli. “Current models underestimate future irrigated areas”. *Geophysical Research Letters* 47.8 (2020), e2020GL087360. DOI: [10.1029/2020GL087360](https://doi.org/10.1029/2020GL087360). R code.
  18. **Arnald Puy**, Samuele Lo Piano, and Andrea Saltelli. “A sensitivity analysis of the PAWN sensitivity index”. *Environmental Modelling & Software* 127 (2020), p. 104679. DOI: [10.1016/j.envsoft.2020.104679](https://doi.org/10.1016/j.envsoft.2020.104679). R code.
  19. **Arnald Puy**, Manuel Herzog, Pedro Escriche, Amou Marouche, Yousef Oubana, and Olaf Bubenzer. “Detection of sand encroachment patterns in desert oases. The case of Erg Chebbi (Morocco)”. *Science of The Total Environment* 642 (2018), pp. 241–249. DOI: [10.1016/j.scitotenv.2018.05.343](https://doi.org/10.1016/j.scitotenv.2018.05.343).
  20. **Arnald Puy**. “Irrigated areas grow faster than the population”. *Ecological Applications* 28.6 (2018), pp. 1413–1419. DOI: [10.1002/eap.1743](https://doi.org/10.1002/eap.1743).
  21. Andrea Luca Balbo, **Arnald Puy**, Jaime Frigola, Fèlix Retamero, Isabel Cacho, and Helena Kirchner. “Amplified environmental change: Evidence from land-use and climate change in medieval Minorca”. *Land Degradation & Development* 29.4 (2018), pp. 1262–1269. DOI: [10.1002/ldr.2869](https://doi.org/10.1002/ldr.2869).
  22. **Arnald Puy**, Rachata Muneeppeerakul, and Andrea Luca Balbo. “Size and stochasticity in irrigated social-ecological systems”. *Scientific Reports* 7 (2017), p. 43943. DOI: [10.1038/srep43943](https://doi.org/10.1038/srep43943).
  23. **Arnald Puy**, José María García Avilés, Andrea Luca Balbo, Michèle Keller, Svenja Riedesel, Daniel Blum, and Olaf Bubenzer. “Drip irrigation uptake in traditional irrigated fields: The edaphological impact”. *Journal of Environmental Management* 202 (2017), pp. 550–561. DOI: [10.1016/j.jenvman.2016.07.017](https://doi.org/10.1016/j.jenvman.2016.07.017).
  24. Andrea Luca Balbo and **Arnald Puy**. “Terrace landscapes. Editorial to the special issue”. *Journal of Environmental Management* 202.3 (2017), pp. 495–499. DOI: [10.1016/j.jenvman.2017.02.001](https://doi.org/10.1016/j.jenvman.2017.02.001).
  25. Andrea Luca Balbo, Erik Gómez-Baggethun, Matthieu Salpeteur, **Arnald Puy**, Stefano Biagetti, and Jürgen Scheffran. “Resilience of small-scale societies: a view from drylands”. *Ecology and Society* 21.2 (2016), art53. DOI: [10.5751/ES-08327-210253](https://doi.org/10.5751/ES-08327-210253).
  26. **Arnald Puy**, Andrea Luca Balbo, and Olaf Bubenzer. “Radiocarbon dating of agrarian terraces by means of buried soils”. *Radiocarbon* 58.02 (2016), pp. 345–363. DOI: [10.1017/RDC.2015.21](https://doi.org/10.1017/RDC.2015.21).
  27. **Arnald Puy**, Andrea Luca Balbo, Camila Zinsli, and Morten Ramstad. “High-resolution stratigraphy of Scandinavian coastal archaeological settlements: the case of Håkonshella, W Norway”. *Boreas* 45.3 (2016), pp. 508–520. DOI: [10.1111/bor.12166](https://doi.org/10.1111/bor.12166).
  28. **Arnald Puy**. “Land selection for irrigation in al-Andalus (Spain, 8th century AD)”. *Journal of Field Archaeology* 39.1 (2014), pp. 84–100. DOI: [10.1179/0093469013Z.00000000072](https://doi.org/10.1179/0093469013Z.00000000072).
  29. **Arnald Puy**, Andrea Luca Balbo, Antoni Virgili, and Helena Kirchner. “The evolution of Mediterranean wetlands in the first millennium AD: The case of Les Arenes floodplain (Tortosa, NE Spain)”. *Geoderma* 232–234 (2014), pp. 219–235. DOI: [10.1016/j.geoderma.2014.05.001](https://doi.org/10.1016/j.geoderma.2014.05.001).
  30. **Arnald Puy** and Andrea Luca Balbo. “The genesis of irrigated terraces in al-Andalus. A geoarchaeological perspective on intensive agriculture in semi-arid environments (Ricote, Murcia, Spain)”. *Journal of Arid Environments* 89 (2013), pp. 45–56. DOI: [10.1016/j.jaridenv.2012.10.008](https://doi.org/10.1016/j.jaridenv.2012.10.008).
  31. **Arnald Puy**. “Tracking down the gliter of gold in the Diplomatarium de Santes Creus”. *Imago Temporis - Medium Aevum* 7 (2013), pp. 175–224. DOI: [10.17605/OSF.IO/P6KMG](https://doi.org/10.17605/OSF.IO/P6KMG).

## Peer-reviewed book chapters

1. Andrea Saltelli, Samuele Lo Piano, and **Arnald Puy**. “Sensitivity Auditing”. *Elgar Encyclopaedia of Ecological Economics*. Ed. by Emilio Padilla Rosa and Jesús Ramos Martín. Edward Elgar Publishing, 2023. DOI: [10.2139/ssrn.3977104](https://doi.org/10.2139/ssrn.3977104).
2. Andrea Saltelli, **Arnald Puy**, and Samuele Lo Piano. “Sensitivity Analysis”. *Elgar Encyclopedia of Ecological Economics*. Ed. by Emilio Padilla Rosa and Jesús Ramos Martín. Edward Elgar Publishing, 2023. DOI: [10.2139/ssrn.3977108](https://doi.org/10.2139/ssrn.3977108).
3. **Arnald Puy** and Andrea Saltelli. “Mind the Hubris: Complexity Can Misfire”. *The Politics of Modelling. Numbers Between Science and Policy*. Ed. by Andrea Saltelli and Monica Di Fiore. Oxford University Press, 2023. arXiv: [2207.12230](https://arxiv.org/abs/2207.12230). [R code](#).
4. Samuele Lo Piano, Razi Sheikholeslami, **Arnald Puy**, and Andrea Saltelli. “Sensitivity Auditing: An Important Ingredient in the Evaluation of Models and Metrics”. *The Politics of Modelling. Numbers Between Science and Policy*. Ed. by Andrea Saltelli and Monica Di Fiore. Oxford: Oxford University Press, 2023.
5. Andrea Saltelli, Monica Di Fiore, Marta Kuk, Samuele Lo Piano, and **Arnald Puy**. “Mind the Framings”. *The Politics of Modelling. Numbers Between Science and Policy*. Ed. by Andrea Saltelli and Monica Di Fiore. Oxford: Oxford University Press, 2023.
6. Andrea Luca Balbo, José María García-Avilés, Johannes Hunink, Francisco Alcón, J.E. Palenzuela-Cruz, J. Martínez, **Arnald Puy**, Joaquín Rodríguez López, and Jürgen Scheffran. “Challenges and Opportunities for Historical Irrigated Agricultural Systems in Mediterranean Regions: Technical, Cultural, and Environmental Assets for Sustainable Rural Development in Ricote (murcia, Spain)”. *Climate Change, Security Risks , and Violence Conflicts. Essays from Integrated Climate Research in Hamburg*. Ed. by Michael Brzoska and Jürgen Scheffran. Hamburg: Hamburg University Press, 2020, pp. 143–162.
7. Helena Kirchner, Antoni Virgili, and **Arnald Puy**. “Drainage and Irrigation Systems in Madina Turtusa (tortosa, Spain) (8th-12th Centuries)”. *Agricultural Landscapes of Al-Andalus, and the Aftermath of the Feudal Conquest*. Ed. by H. Kirchner and F. Sabaté. Turnhout: Brepols Publisher, 2021, pp. 153–172.
8. **Arnald Puy**. “La Huerta De Ricote (Murcia, España) Entre Los Siglos XV Y XVIII”. *Estudiar El Pasado: Aspectos Metodológicos De La Investigación En Ciencias De La Antigüedad Y De La Edad Media. Proceedings of the First Postgraduate Conference on Studies of Antiquity and Middle Ages Universitat Autònoma De Barcelona 26-28th October 2010*. Ed. by Ainoa Castro Correa, Daniel Gómez Castro, Gerard González Germain, Joan Oller Guzmán, **Arnald Puy**, Roger Riera Vargas, Kasia Krystyna Starczewska, and Nereida Villagra Hidalgo. Oxford: BAR International Series 2412, 2012, pp. 199–209. DOI: [10.13140/2.1.1883.4887](https://doi.org/10.13140/2.1.1883.4887).

## Edited books

1. Ainoa Castro Correa, Daniel Gómez Castro, Gerard González Germain, Joan Oller Guzmán, **Arnald Puy**, Roger Riera Vargas, Kasia Krystyna Starczewska, and Nereida Villagra Hidalgo, eds. *Estudiar El Pasado: Aspectos Metodológicos De La Investigación En Ciencias De La Antigüedad y De La Edad Media. Proceedings of the First Postgraduate Conference on Studies of Antiquity and Middle Ages Universitat Autònoma De Barcelona 26-28th October 2010*. BAR International Series 2412, 2012.

## Non peer-reviewed papers

1. **Arnald Puy**, Razi Sheikholeslami, Hoshin Gupta, Jim Hall, Bruce Lankford, Samuele Lo Piano, Jonas Meier, Florian Pappenberger, Amilcare Porporato, Giulia Vico, and Andrea Saltelli. “How certain are we about the model-based estimations of global irrigation water withdrawal?” EGU General Assembly. 2022, EGU22–8603. DOI: [10.5194/egusphere-egu22-8603](https://doi.org/10.5194/egusphere-egu22-8603).
2. **Arnald Puy**, Emanuele Borgonovo, Samuele Lo Piano, and Andrea Saltelli. “Are the results of the ground-water model robust?” 2019. arXiv: [1912.10814](https://arxiv.org/abs/1912.10814).
3. **Arnald Puy**. “The construction of fertility in al-Andalus. Geoarchaeology in Ricote (Murcia, Spain, 8th century AD)”. *Geophysical Research Abstracts* 15 (2013), p. 2335.
4. **Arnald Puy**. “Moneda, peces de moneda d’or i magnats a santes creus”. *Revista de l’Arxiu Bibliogràfic de Santes Creus* 23 (2010), pp. 39–49.

5. **Arnald Puy**. “La moneda d’or al diplomatarí de Santa Maria de Santes Creus (975-1225)”. *Gaceta Numismática* 169 (2008), pp. 39–60.

## Under review

1. **Arnald Puy** and Bruce Lankford. “Fallacies in the Global Water Crisis statistics”. *Water Alternatives* (2024).
2. Andrea Saltelli, Gerd Gigerenzer, Konstantinos V. Katsikopoulos, Glen Peters P., Massimo Tavoni, and **Arnald Puy**. “Why we cannot make a digital twin of the Earth”. *Communications Earth & Environment* (2023).
3. **Arnald Puy**, Pamphile T. Roy, and Andrea Saltelli. “Discrepancy measures for sensitivity analysis”. *Technometrics* (2023). arXiv: [2206.13470](https://arxiv.org/abs/2206.13470). [R code](#).
4. Andrea Saltelli, **Arnald Puy**, and Monica Di Fiore. “Mathematical models: state of exception?” *ACM Transactions on Modeling and Computer Simulation* (2023). arXiv: [1712.06457](https://arxiv.org/abs/1712.06457) [[stat](#)]
5. Samuele Lo Piano, Máté János Lőrincz, **Arnald Puy**, Steve Pye, Andrea Saltelli, Stefán Thor Smith, and Jeroen P. van der Sluijs. “Unpacking uncertainty in the modelling process for energy policy making”. *Energy Research & Social Science* (2021). arXiv: [2111.00782](https://arxiv.org/abs/2111.00782).

## Technical reports

1. **Arnald Puy**. *Intermediate Micromorphological Report of Tour Anneessens*. Brussels: Université Libre de Bruxelles, 2019.
2. **Arnald Puy**. *Micromorphological Report of La Rue Du Chien Marin*. Brussels: Université Libre de Bruxelles, 2019.
3. **Arnald Puy**. *Micromorphological Report of Watermael Boitsfort*. Brussels: Université Libre de Bruxelles, 2019.
4. **Arnald Puy**. *Micromorphological Report of La Porte De Hal*. Brussels: Université Libre de Bruxelles, 2018.
5. **Arnald Puy**. *Micromorphological Report of La Ferme Rose*. Brussels: Université Libre de Bruxelles, 2018.
6. **Arnald Puy**. *Micromorphological Report of Hof Ter Coign*. Brussels: Université Libre de Bruxelles, 2018. DOI: [10.17605/OSF.IO/YTPJH](https://doi.org/10.17605/OSF.IO/YTPJH).
7. **Arnald Puy**. *Micromorphological Report of Tour Anneessens*. Brussels: Université Libre de Bruxelles, 2018. DOI: [10.17605/OSF.IO/2AMWJ](https://doi.org/10.17605/OSF.IO/2AMWJ).

## R packages

1. `sensobol`. <https://cran.r-project.org/web/packages/sensobol/index.html>

## Fellowships, grants and awards

2023 Sep	<b>UKRI Frontier Research Grant (UK)</b> FUNDS: £1.691.523
2023 Jan	<b>ERC Consolidator Grant (EU)</b> FUNDS: 1.997.215€ <a href="#">Press release by University of Bergen</a> <a href="#">Press release by University of Birmingham</a> Terminated before grant agreement due to Brexit; converted into UKRI Frontier Research Grant.
2018 Jan	<b>Marie Skłodowska-Curie Individual Fellowship–Global Fellowship (IF–GF) (EU)</b>

	FUNDS: 276.330,60€ SCORE: 99.2/100, ENV panel
2015 May	<b>Outstanding PhD Award</b> Award granted by UAB to PhD theses of exceptional scientific relevance
2014 Oct	<b>Humboldt Research Stay Abroad Grant, Alexander von Humboldt Foundation (Germany)</b> FUNDS: 2.000€
2013 Nov	<b>Marie Curie Intra-European Fellowship (IEF) (EU)</b> FUNDS: 185.558,80€ SCORE: 99.4/100, SOC panel
2013 Nov	<b>Humboldt Research Fellowship, Alexander von Humboldt Foundation (Germany)</b> FUNDS: 82.800€
2013 Apr	<b>The Wenner-Gren Foundation Post-PhD Research Grant (NY, USA)</b> FUNDS: 17.580€
2011 Jan	<b>Ministry of Science and Innovation, Research Stays Abroad Grant (Spain)</b> FUNDS: 3.100€
2010 Feb	<b>Ministry of Science and Innovation, Research Stays Abroad Grant (Spain)</b> FUNDS: 7.350€
2009 Nov	<b>Ministry of Science and Innovation, Research Stays Abroad Grant (Spain)</b> FUNDS: 3.640€
2009 Feb	<b>Research Grant. Centro de Experimentación y Obras Públicas (CEDEX), Spain</b> FUNDS: 6.760€
2009 Nov	<b>Joaquím Sarret i Arboç award (Spain)</b> 600€-award granted to the best MA dissertation
2008 Sep	<b>Formación de Personal Investigador Fellowship (FPI)</b> FUNDS: 60.000€

## Projects directed as PI

2023-2028	<b>illuminating deep uncertainties in the estimation of irrigation water withdrawals (DAWN, #101086688)</b> ERC Consolidator Grants, European Commission. 1.997.215€
2019-2022	<b>The role of size in the sustainability of irrigation systems (SIZE, #792178)</b> European Commission H2020, EU. 276.330,80€ <a href="https://cordis.europa.eu/project/rcn/214099_en.html">https://cordis.europa.eu/project/rcn/214099_en.html</a> Results in Brief article in Cordis
2015-2017	<b>Bloom the dry II. The creation of traditional Mediterranean irrigated fields (DryIR, #623098)</b> European Commission FP7, EU. 184.558,80€ <a href="https://cordis.europa.eu/project/rcn/187738_en.html">https://cordis.europa.eu/project/rcn/187738_en.html</a>
2014-2017	<b>Bloom the dry I. The creation of traditional Mediterranean irrigated fields</b>

	Alexander von Humboldt Foundation, Germany. 82.800€
2013–2015	<b>Building up intensive labour areas: terraces, irrigation and agrarian change in the Ricote Valley (Murcia, Spain) after 711 AD (#8716)</b> The Wenner-Gren Foundation for Anthropological Research, USA \$17.580 <a href="http://www.wennergren.org/grantees/puy-maeso-arnald">http://www.wennergren.org/grantees/puy-maeso-arnald</a>

## Stays in internationally recognized research centers ( $\geq 6$ months)

2011	<b>Charles McBurney Laboratory</b> University of Cambridge, UK
2010	<b>Departamento de Prehistoria, Arqueología, Historia Antigua, Historia Medieval y Ciencias y Técnicas Historiográficas</b> Universidad de Murcia, Spain.

## Congresses, conferences and workshops

### International

2022 May	<b>Aprendiz de todo y maestro de nada, o cómo se forma un perfil interdisciplinar</b> MAIN AUTHOR: Arnald Puy Facultad de Filosofía e Historia, Universidad de Salamanca, Spain.
2022 May	<b>Why more detail may boost uncertainties</b> MAIN AUTHOR: Arnald Puy Computational Science Lab at the Informatics Institute, University of Amsterdam, Netherlands.
2022 Jul	<b>What contribution can sensitivity analysis and sensitivity auditing offer to the opening of the box of models?</b> MAIN AUTHOR: Andrea Saltelli CO-AUTHORS: Monica Di Fiore, Arnald Puy International Congress on Environmental Modelling & Software (iEMS), Brussels, Belgium
2022 Apr	<b>The Cartesian dream in mathematical models for policy-making</b> MAIN AUTHOR: Arnald Puy CEREAL seminar (Conversations on the Environment, Responsible Energy, And Life), Princeton University, USA
2022 Apr	<b>How certain are we about the model-based estimations of global irrigation water withdrawal?</b> MAIN AUTHOR: Razi Sheikholeslami CO-AUTHORS: Arnald Puy, Hoshin Gupta, Jim Hall, Bruce Lankford, Samuele Lo Piano, Jonas Meier, Florian Pappenberger, Amilcare Porporato, Giulia Vico, and Andrea Saltelli EGU General Assembly 2022, Vienna, Austria
2022 Mar	<b>Sensitivity analysis as a tool to probe into the relation between model complexity and uncertainty</b> MAIN AUTHOR: Arnald Puy CO-AUTHORS: Pierfrancesco Beneventano, Simon Levin, Samuele Lo Piano, Tommaso Portaluri, Andrea Saltelli 10th International Conference on Sensitivity Analysis of Model Output, Tallahassee, Florida, USA

- 2021 Oct **The project DAWN: Illuminating deep uncertainties in the estimation of irrigation water withdrawals**  
 MAIN AUTHOR: Arnald Puy  
 AFINO workshop, Selbu, Norway  
Invited speaker
- 2021 Mar **Mathematical models for policy-making and the illusion of accuracy**  
 MAIN AUTHOR: Arnald Puy  
 Department of Geography. University of Bergen, Norway
- 2021 Mar **Numbers and models for policy-making in agriculture**  
 MAIN AUTHOR: Arnald Puy  
 Center for the Sciences and the Humanities. University of Bergen, Norway
- 2020 Nov **Complex vs. simple models. An example on irrigation agriculture**  
 MAIN AUTHOR: Arnald Puy  
 Conversation Hour of the Levin Lab. Ecology and Evolutionary Biology Department, Princeton University, USA
- 2020 Feb **The scale of irrigated agriculture matters. Should we believe official projections to 2050?**  
 MAIN AUTHOR: Arnald Puy  
 Center for the Sciences and the Humanities. University of Bergen, Norway
- 2020 Jan **Is the model robust against uncertainties? a brief introduction to sensitivity analysis**  
 MAIN AUTHOR: Arnald Puy  
 Brown Bag Lunch Seminar. Stockholm Resilience Center, Stockholm, Sweden.
- 2019 Dec **Why uncertainty and sensitivity analysis? Some very simple examples**  
 MAIN AUTHOR: Arnald Puy  
 Conversation Hour of the Levin Lab. Ecology and Evolutionary Biology Department, Princeton University, USA.
- 2019 Oct **Is it possible to improve existing sample-based algorithm to compute the total sensitivity index?**  
 MAIN AUTHOR: Samuele Lo Piano  
 CO-AUTHORS: Federico Ferretti, Arnald Puy, Daniel Albrecht, Stefano Tarantola, Andrea Saltelli  
 Ninth International Conference on Sensitivity Analysis of Model Output. Universitat Oberta de Catalunya, Barcelona, Spain.
- 2019 Oct **How sensible is the PAWN index to its tuning parameters?**  
 MAIN AUTHOR: Arnald Puy  
 CO-AUTHORS: Samuele Lo Piano, Andrea Saltelli  
 Ninth International Conference on Sensitivity Analysis of Model Output. Universitat Oberta de Catalunya, Barcelona, Spain.
- 2019 May **Why FAOs projection of Mediterranean (and global) irrigated areas to 2050 should not be trusted**  
 MAIN AUTHOR: Arnald Puy  
 Challenges and opportunities for the sustainable development of Mediterranean rural regions: integrating agricultural, environmental and cultural heritage. Ricote, Spain. Invited speaker
- 2019 Apr **Current projections of global irrigated areas are fragile against uncertainty**



- MAIN AUTHOR: Arnald Puy  
 CO-AUTHORS: Samuele Lo Piano, Andrea Saltelli  
 Humboldt Colloquium “Research without Borders. Alexander von Humboldt’s Legacy Today”. Madrid, Spain. Invited poster
- 2019 Mar **Can we predict future irrigated areas?**  
<https://doi.org/10.6084/m9.figshare.7902623>  
 MAIN AUTHOR: Arnald Puy  
 Young-researchers workshop: The challenge of sustainability across scales and dimensions. Universitat Oberta de Catalunya, Barcelona, Spain. Invited speaker
- 2019 Mar **Uncertainty and global sensitivity analysis of the projection of continental and global irrigated areas to 2050**  
<https://doi.org/10.6084/m9.figshare.7856963>  
 MAIN AUTHOR: Arnald Puy  
 CO-AUTHORS: Samuele Lo Piano, Andrea Saltelli  
 Society for Risk Analysis (SRA) - Benelux 2019 Annual Conference: “Reasoning with Uncertainty”. University of Luxembourg, Luxembourg.
- 2018 Nov **Les études géoarchéologiques dans le centre historique de Bruxelles**  
 MAIN AUTHOR: Yannick Devos  
 CO-AUTHORS: Cristiano Nicosia, Arnald Puy  
 CReA Patrimoine, Université Libre de Bruxelles. Brussels, Belgium.
- 2018 Aug **A stable floor in Tour Anneessens, Brussels**  
<https://doi.org/10.6084/m9.figshare.6828668.v2>  
 MAIN AUTHOR: Arnald Puy  
 CO-AUTHORS: Yannick Devos  
 International Workshop on Archaeological Soil Micromorphology. Brussels, Belgium. Organizing Committee
- 2018 Jun **How to better protect oases from sand encroachment? Insights from Erg Chebbi (Morocco)**  
 MAIN AUTHOR: Arnald Puy  
 Navigating Complexity: human-environmental solutions for a challenging future. XXIII International Conference of the Society for Human Ecology. Lisbon, Portugal
- 2017 Oct **Dynamics between sand inputs and irrigation in the oases of Merzouga and Hassilabiad (Morocco). Preliminary results**  
 MAIN AUTHOR: Arnald Puy  
 From refugia to oases: living in arid environments from prehistoric times to the present day. 38ème Rencontres Internationales d’Archéologie et d’Histoire d’Antibes, CEPAM, Nice, France. Invited speaker
- 2016 Aug **Increasing the resolution of Scandinavian anthropic deposits: the potential of XRF core scanning and geoarchaeology**  
 MAIN AUTHOR: Arnald Puy  
 CO-AUTHORS: A.L. Balbo, Camilla Zinsli, Morten Ramstad  
 4th International Landscape Archaeology Conference, University of Uppsala, Uppsala, Sweden
- 2015 May **Land use and climate change in Minorca between al Andalus and the feudal conquest**  
 MAIN AUTHOR: A.L. Balbo  
 CO-AUTHORS: Jaime Frigola, Fèlix Retamero, Helena Kirchner, Isabel Cacho  
 Shaping the Mediterranean basin: islands, coastlines and cultures. International Geoarchaeology Workshop, Cagliari, Sardinia

- 2015 May **An integrative approach to assess the reliability of AMS dates for terrace construction: bulk analyses, terrace clustering and statistics**  
 MAIN AUTHOR: Arnald Puy  
 Shaping the Mediterranean basin: islands, coastlines and cultures. International Geoarchaeology Workshop, Cagliari, Sardinia. Invited speaker
- 2015 Apr **A long-term perspective on Western Mediterranean irrigation: past and future prospects**  
 MAIN AUTHOR: Arnald Puy  
 Conference at Maritime Civilizations Department, Haifa University, Israel Invited speaker
- 2014 Dec **Socio-ecological resilience of small-scale societies in drought-prone regions**  
 MAIN AUTHOR: Andrea L. Balbo  
 CO-AUTHORS: Stefano Biagetti, Erik Gómez-Baggethun, Matthieu Salpeteur, Jürgen Scheffran  
 Conference Small-scale societies and environmental transformations: co-evolutionary dynamics, Barcelona. Invited speaker
- 2014 Nov **The creation and management of traditional Mediterranean irrigated fields**  
 MAIN AUTHOR: Arnald Puy  
 Humboldt Network Meeting, Julius- Maximilians-Universität Würzburg, Würzburg, Germany. Invited speaker
- 2014 Oct **The creation and management of traditional Mediterranean irrigated fields**  
 MAIN AUTHOR: Arnald Puy  
 Geographisches Institut, Universität zu Köln, Köln, Germany. Invited speaker
- 2013 Jul **Terrasses et archéologie d'al-Andalus: possibilités d'étude**  
 MAIN AUTHOR: Arnald Puy  
 Conference at Université Sidi Mohamed ben Abdellah, Fes, Morocco. Invited speaker
- 2013 May **From dry to wet, from wet to dry. Micromorphological and physico-chemical features of strategies of soil reclamation in al-Andalus**  
 MAIN AUTHOR: Arnald Puy  
 CO-AUTHOR: Andrea L. Balbo  
 25th International soil micromorphology workshop, Charles McBurney Geoarchaeological Laboratory, Department of Archaeology, University of Cambridge, UK
- 2013 Apr **The creation of fertility in al-Andalus. Geoarchaeology in Ricote**  
 MAIN AUTHOR: Arnald Puy  
 European Geosciences Union (EGU) General Assembly, Vienna, Austria
- 2013 Mar **Drylands in bloom**  
 MAIN AUTHOR: Arnald Puy  
 Conference at the Kimmel Centre for Archaeological Science, Weizmann Institute of Science, Israel
- 2012 Nov **Pre-andalusi soils and irrigated terraces in Ricote (Murcia, Spain).**  
 MAIN AUTHOR: Arnald Puy  
 Society for Medieval Archaeology student colloquium, Cardiff University, UK
- 2012 Jun **Buried soils under terrace fills. Reconstructing the formative stages of the hydraulic system of Ricote (Murcia, Spain)**  
 MAIN AUTHOR: Arnald Puy  
 2nd International Medieval Meeting, Universitat de Lleida, Spain

- 2011 Jun **Possibilities for topographical analysis of andalusi hydraulic systems**  
 MAIN AUTHOR: Arnald Puy  
 1st International Medieval Meeting, Universitat de Lleida, Spain
- 2011 Jun **Irrigation and drainage around the Islamic city of Turtusa (Spain)**  
 MAIN AUTHOR: Helena Kirchner  
 CO-AUTHORS: Antoni Virgili  
 1st International Medieval Meeting, Universitat de Lleida, Spain

## National

- 2015 Sep **La huerta de Ricote entre pasado y futuro. Historia, arqueología, tecnología**  
 MAIN AUTHOR: Arnald Puy  
 CO-AUTHORS: Andrea L. Balbo  
 Conference at the Ayuntamiento de Ricote, Ricote, Murcia. Invited speaker
- 2014 Jun **¿Cómo se transforma un terreno seco en una zona agraria fértil y productiva?. Ejemplos de al-Andalus (siglos VIII-XV dC)**  
 MAIN AUTHOR: Arnald Puy  
 Converses del Raval, IMF-CSIC, Barcelona, Spain. Invited speaker
- 2013 Nov **Geoarqueología de los espacios irrigados tradicionales del Mediterráneo**  
 MAIN AUTHOR: Arnald Puy  
 Archéogéographie et anthropologie de l'espace. L'agriculture irriguée et la morphologie agraire des milieux humides. Casa de Velázquez, Madrid, Spain. Invited speaker
- 2012 Dec **Cómo y cuándo se fundó la huerta de Ricote (Murcia, España)**  
 MAIN AUTHOR: Arnald Puy  
 Centro de conferencias de Ricote, Murcia, Spain. Invited speaker
- 2011 Jun **Possibilitats del registre topogràfic en l'estudi de les hortes del sud-est peninsular. El cas de Ricote (Murcia, Spain)**  
 MAIN AUTHOR: Arnald Puy  
 Facultat de Geografia i Història, Universitat de València, València, Spain. Invited speaker
- 2010 Oct **Cuestiones metodológicas sobre la arqueología hidráulica**  
 MAIN AUTHOR: Arnald Puy  
 First postgraduate conference on studies of Antiquity and Middle Ages. Universitat Autònoma de Barcelona, Barcelona, Spain
- 2010 Oct **Cuestiones metodológicas sobre la arqueología hidráulica**  
 MAIN AUTHOR: Arnald Puy  
 First postgraduate conference on studies of Antiquity and Middle Ages. Universitat Autònoma de Barcelona, Barcelona, Spain
- 2010 Apr **Arqueología hidráulica en Ricote**  
 MAIN AUTHOR: Arnald Puy  
 Conference at the Universidad de Murcia, Spain

## Fieldwork campaigns

- 2017 Nov Soil sampling in Erg Chebbi and the Ziz Valley, Morocco. PI: Arnald Puy

2016 Oct	Soil sampling and measurement of aeolian sand inputs in the oases of Hassilabiad and Merzouga, Erg Chebbi, Morocco. PI: Arnald Puy
2015 Oct	Core drilling, soil sampling and ERT (Electrical Resistivity Tomography) measurements in Saddina, Taounate, Morocco. PI: Arnald Puy
2015 Oct	Soil sampling and dune drilling in Erg Chebbi, Morocco. PIs: Arnald Puy and Olaf Bubbenzer
2015 Sep	Soil augering of drip-irrigated and flood-irrigated plots in Ricote, Murcia, Spain. PIs: Arnald Puy and Olaf Bubbenzer
2015 Feb	UAV (Unmanned Aerial Vehicle) survey of the Ricote Valley, Murcia, Spain. PIs: Arnald Puy and Steve Markofsky
2015 Jan	Geoarchaeological trenching and sampling of the huerta of Valencia, Valencia, Spain. PIs: Arnald Puy and Enric Guinot
2014 Sep	Soil sampling and geoelectrical measurements [Electrical Resistivity Tomography (ERT)] of drip-irrigated and flood-irrigated plots, Ricote, Spain. PI: Arnald Puy
2014 Feb	Geoarchaeological excavations in the irrigated terraces of Ricote, Murcia, Spain. PI: Arnald Puy
2013 Jul	Saddina and Mghila sites survey, Fès-Bouleman, Morocco. PI: Virgilio Martínez Enamorado
2012 Jun	Sampling and analysis of the Vaksdal charcoal pit (Viking Age), Bergen, Norway. PI: Morten Råmstad
2012 Apr	Sampling of Mesolithic and Neolithic soils in Hakönshella, Bergen, Norway. PI: Morten Råmstad
2011 Nov	Field survey of the Cabezo del Rife hill, Murcia, Spain. PI: Arnald Puy
2011 Jul	Field survey and geoarchaeological sampling of the Lower Ebro alluvial plain, Tortosa, Spain. PI: Helena Kirchner
2010 Nov	Archaeological excavation and geoarchaeological sampling of irrigated terraces, Ricote, Murcia, Spain. PI: Arnald Puy
2010 Jul	Field survey of the Lower Ebro river, Tortosa, Spain. PI: Helena Kirchner
2009 Jul	Archaeological excavation of Torrepetxina Vella site, Menorca, Spain. PI: Helena Kirchner
2008 Jul	Survey of the hydraulic system of Casarabonela, Málaga, Spain. PI: Fèlix Retamero
2007 Sep	Field survey and archaeological excavation of Es Torretó site, Menorca, Spain. PI: Helena Kirchner

## Thematic courses and workshops attended

2018 Aug	<b>Numbers for policy: practical problems in quantification</b> Centre for the Study of the Sciences and the Humanities, University of Bergen (Norway), & Open Evidence Research, Universitat Oberta de Catalunya (UOC) (Spain). Universitat Oberta de Catalunya, Castelldefels, Spain.
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2018 Jun	<b>Tenth summer school on sensitivity analysis of model output</b> Joint Research Centre (JRC), European Commission. Hotel Conca Azurra, Ranco, Italy.
2018 Apr	<b>Fractals and scaling</b> Complexity Explorer, Santa Fe Institute, USA.
2017 Feb	<b>Sensitivity analysis, sensitivity auditing and beyond</b> Institut de Ciència i Tecnologia Ambientals (ICTA), Universitat Autònoma de Barcelona, Spain
2013 Feb	<b>Complexity and network theory</b> Institució Milà i Fontanals, CSIC Barcelona, Spain
2011 Feb	<b>Soil micromorphology and geoarchaeology</b> Department of Archaeology, University of Cambridge, UK
2010 Feb	<b>Stable isotopes and environmental change</b> Department of Archaeology, University College London, UK
2008 Nov	<b>GIS specialized course</b> CREAF, Facultat de Ciències, Universitat Autònoma de Barcelona, Spain

## Teaching

2022-2023	<b>Quantitative Analysis of Hydrological Processes</b> Lecturer. School of Geography, Earth and Environmental Sciences, University of Birmingham, UK.
2011–2012	<b>Agrarian Archaeology (fieldwork)</b> Archaeology Degree, Universitat Autònoma de Barcelona, Spain
2009–2010	<b>Techniques for Historical Research II</b> History Degree, Universitat Autònoma de Barcelona, Spain

## Languages

Spanish	Mother tongue
Catalan	Mother tongue
English	Proficient

## Software

<i>R</i>	Proficient
<i>XLSTAT</i>	Proficient
<i>L<sup>A</sup>T<sub>E</sub>X</i>	Proficient
Microsoft Office	Proficient

## Memberships

2018	Ecological Society of America
2018	Society for Human Ecology

## Mentored students

2014–2015	<p><b>Svenja Riedesel (Institute of Geography, University of Cologne, Germany)</b> I provided Svenja with training in soil sampling methods, follow-up during her BA degree in Geography, externally reviewed her BA thesis “Transport and sedimentation of modern litoral and fluvial deposits along the Black Sea coast of Georgia. A multi-proxy dataset approach”, graded 1 out of 4 (1 = highest grade, 4 = lowest grade), and provided references for her applications to conduct the MSc degree abroad.</p> <p><b>Michèle Keller (Institute of Geography, University of Cologne, Germany)</b> I hired Michelle as a student to provide support in the laboratory, and trained her in soil physico-chemical analysis such as PSD, carbon tests and pH/EC.</p>
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## Scientific and societal impact

2022 Dec	Interview in the article “Over-pursuing the complexity of the model is counterproductive”, published in the <a href="#">Chinese Academy of Social Sciences magazine</a> (in Chinese).
2022 Nov	<b>Arnald Puy.</b> <i>How a quest for mathematical truth and complex models can lead to useless scientific predictions – new research.</i> The Conversation. 2022. URL: <a href="https://theconversation.com/how-a-quest-for-mathematical-truth-and-complex-models-can-lead-to-useless-scientific-predictions-new-research-192454">https://theconversation.com/how-a-quest-for-mathematical-truth-and-complex-models-can-lead-to-useless-scientific-predictions-new-research-192454</a> (visited on 11/03/2022).
2020 Sep	Scientific advisor for the article “Modelos matemáticos, mirada social”, published in the Spanish Newspaper <a href="#">El Periódico</a>
2020 July	Op-ed with Ismael Ràfols in the Spanish Newspaper <a href="#">El Periódico</a> , “Modelos matemáticos y decisiones políticas”
2020 July	Interview in <a href="#">Cadena SER</a> radio station (Spain) on how to make models useful to society (in Catalan)
2020 July	Interview in the <a href="#">Nació Digital</a> newspaper on how to make models useful to society (in Catalan)
2020 June	Interview in <a href="#">Regió 7</a> newspaper on uncertainty in models (in Catalan)

## Scientific reviewing

Journals	Science, Nature Reviews Earth & Environment, Nature Sustainability, Oxford University Press, Journal of Statistical Software, Geophysical Research Letters, Water Resources Research, Environmental Modeling & Software, Reliability Systems and Engineering Safety, Arid Land Research and Management, Catena, Land Degradation and Development, Environmental and Natural Resources Research Journal, Revista del Centro de Estudios Históricos de Granada y su Reino.
Funding	ERC Synergy Grant, National Geographic Society, Israel Science Foundation.

## Scientific referees

NAME, SURNAME: Andrea Saltelli

PROFESSIONAL RELATIONSHIP WITH APPLICANT: Mentor

LENGTH OF RELATIONSHIP: 2017–present  
BODY TO WHICH THEY BELONG TODAY: Universitat Pompeu Fabra  
POST: Professor  
TELEPHONE: +34 652-401-371  
E-MAIL: [andrea.saltelli@gmail.com](mailto:andrea.saltelli@gmail.com)

NAME, SURNAME: Simon Levin  
PROFESSIONAL RELATIONSHIP WITH APPLICANT: Mentor in Princeton  
LENGTH OF RELATIONSHIP: 2019–present  
BODY TO WHICH THEY BELONG TODAY: Princeton University  
POST: James S. McDonnell Distinguished University Professor in Ecology and Evolutionary Biology  
TELEPHONE: +1 609 258 6880  
E-MAIL: [slevin@princeton.edu](mailto:slevin@princeton.edu)

NAME, SURNAME: Olaf Bubenzer  
PROFESSIONAL RELATIONSHIP WITH APPLICANT: Supervisor in Cologne  
LENGTH OF RELATIONSHIP: 2014–2015  
BODY TO WHICH THEY BELONG TODAY: University of Heidelberg  
POST: Professor in Quaternary Research and Applied Geomorphology  
TELEPHONE: : +49 (0) 6221-54-4571  
E-MAIL: [olaf.bubenzer@geog.uni-heidelberg.de](mailto:olaf.bubenzer@geog.uni-heidelberg.de)

NAME, SURNAME: Ruth Shahack-Gross  
PROFESSIONAL RELATIONSHIP WITH APPLICANT: Supervisor in Haifa  
LENGTH OF RELATIONSHIP: 2015–2017  
BODY TO WHICH THEY BELONG TODAY: University of Haifa  
POST: Professor in Sedimentary Archaeology  
TELEPHONE: +972-54-760-8637  
E-MAIL: [rgross@univ.haifa.ac.il](mailto:rgross@univ.haifa.ac.il)

NAME, SURNAME: Charles A.I. French  
PROFESSIONAL RELATIONSHIP WITH APPLICANT: Supervisor in Cambridge  
LENGTH OF RELATIONSHIP: 2011–2013  
BODY TO WHICH THEY BELONG TODAY: University of Cambridge  
POST: Professor in Geoarchaeology  
TELEPHONE: +44 (0) 1223 333533  
E-MAIL: [caif2@cam.ac.uk](mailto:caif2@cam.ac.uk)

NAME, SURNAME: Andrea L. Balbo  
PROFESSIONAL RELATIONSHIP WITH APPLICANT: Mentor  
LENGTH OF RELATIONSHIP: 2009–2017  
BODY TO WHICH THEY BELONG TODAY: University of Genève  
POST: Researcher  
TELEPHONE: +34 (0) 93 442 34 89  
E-MAIL: [kofibab@gmail.com](mailto:kofibab@gmail.com)