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JCS PRIZE

2022 Winners: Kathleen Scheffler, Federica Giannini and Tom Lemonnier

Michael Way[1,*]

We are pleased to announce that the joint winners of the 2022 JCS Prize are Kathleen Scheffler, Federica Giannini and Tom Lemonnier for their paper entitled 'The prophase oocyte nucleus is a homeostatic G-actin buffer' (Scheffler et al., 2022).

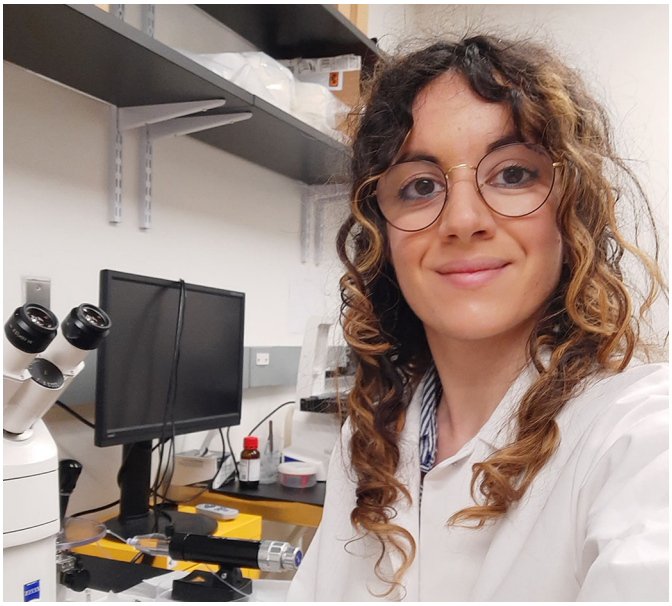
The JCS Prize, of £1000, is awarded annually to the first author(s) of the paper that is judged by the Editors and Editor-in-Chief to be the best research article published in the Journal of Cell Science that year. You can find out more about this year's winners below. A list of articles that were short-listed for the prize can also be found at the end of this article.

We'd like to take this opportunity to acknowledge the authors of all our 2022 papers for their valuable contributions to the journal, and to congratulate the prize winners and those shortlisted by our Editors.

Kathleen Scheffler studied biology at Dresden University of Technology and completed her undergraduate degree in Takashi Toda's lab at the Cancer Research UK London Research Institute (now the Francis Crick Institute) in London, UK, where she was introduced to the exciting field of cytoskeletal research. During her PhD with Phong Tran at Institute Curie in Paris, France, she investigated cytoskeletal organization and function in fission yeast, discovering new mechanisms of microtubule-dependent cell morphogenesis (Scheffler et al., 2014) and motorized nuclear migration in meiosis driven by kinesin-14 and dynein (Scheffler et al., 2015). The latter work demonstrated that these two motor proteins, despite having the same directionality, have separate functions in bringing nuclei together – kinesin-14 by sliding microtubules connecting the nuclei, and dynein by catching and pulling on oncoming microtubules at the nuclear surface. These breakthroughs inspired Kathleen to apply her expertise in mechanistic studies of the cytoskeleton to the understanding of how parental pronuclei in newly formed embryos migrate towards each other during early mammalian development. She addressed this question in developmental biology in the laboratory of Melina Schuh at the MRC-LMB in Cambridge, UK, and the MPI of Biophysical Chemistry in Göttingen, Germany. There, she developed advanced live microscopy assays to monitor cytoskeletal and pronuclear dynamics in mammalian embryos at unprecedented spatiotemporal resolution. This revealed that pronuclear migration in early mouse embryos occurs through two independent mechanisms, which result in distinct phases and nuclear movement pattern (Scheffler et al., 2021). First, pronuclei are rapidly catapulted off the cell surface through solely actin-dependent forces generated by spire and formin-2 accumulating at the cell surface. Subsequently, in the central region of the cell, the pronuclei are slowly carried inwards by microtubules and dynein

Kathleen Scheffler

with the help of the actin cortex. Since joining Binyam Mogessie's lab in 2019, then at the University of Bristol, UK, and now at Yale University, USA, Kathleen has combined her expertise in quantitative microscopy and reproductive cell biology to discover nuclear F-actin structures that are assembled in the oocyte nucleus and are intimately linked with chromatin dynamics (Scheffler et al., 2022). As an Associate Research Scientist in the Mogessie lab, she continues to investigate new functions of the actin cytoskeleton in



Federica Giannini

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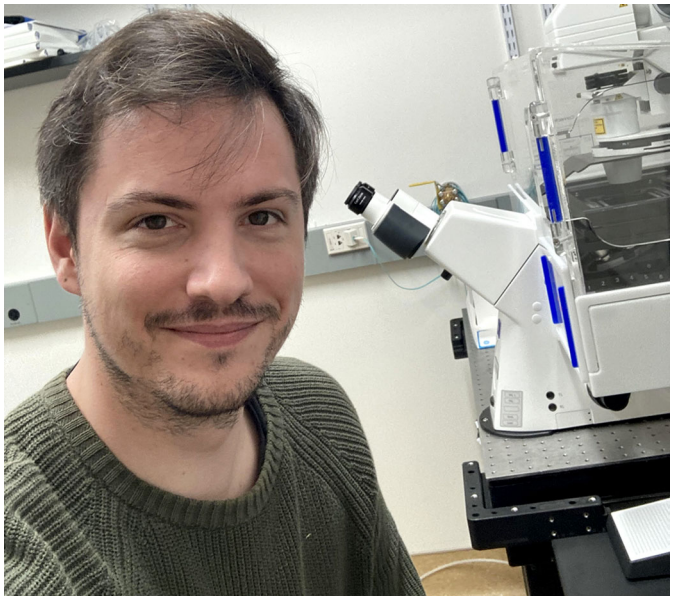
Journal of Cell Science (2023) 136, jcs261249. doi:10.1242/jcs.261249



Tom Lemonnier

oocyte chromosome segregation and the molecular causes of female reproductive aging.

Federica Giannini was born in Potenza, Italy. As an undergraduate student, she studied Biology at the Polytechnic University of Marche in Ancona, where she gained research experience in the lab of Prof. Oliana Carnevali for her thesis project. During this period, she investigated the effect of exposure to plastic polycarbonates, such as bisphenol A, on the metabolic and reproductive systems of zebrafish research models. This experience solidified her interest in biology and she later pursued a Master's degree in Molecular Biology and Genetics at the University of Pavia, Italy. There, she joined the laboratories of Maurizio Zuccotti and Silvia Garagna, where she carried out her Master's thesis research work on asymmetric cell division mechanisms in oocytes. She then received an Erasmus Scholarship and a European Society of Human Reproduction and Embryology Fellowship to join Binyam Mogessie's laboratory at the University of Bristol, as a postgraduate trainee, and later as a PhD student. In the Mogessie lab, Federica discovered new F-actin structures that are assembled inside the nucleus of mammalian oocytes (Scheffler et al., 2022) and showed that these decline with increasing female reproductive age. This work has conceptually advanced our understanding of cytoskeletal organization principles in female meiosis and has opened new possibilities to examine previously unknown causes of female infertility. Now at Yale University, the Mogessie lab's new home, Federica is investigating the role of nuclear F-actin structures in maintaining oocyte genome stability.

Tom Lemonnier was born in Angoulême, France. After a year in medical school, he studied Cell Biology and Biochemistry at the University Pierre and Marie Curie (now Sorbonne University) in Paris, France, where he earned his Bachelor's degree in 2013. During his Master's degree, Tom became fascinated with the early steps of multicellular organismal development. At Sorbonne University, under the supervision of Dr Ronan Le Bouffant and Dr Michael Schubert, he studied the early steps of mesoderm formation and the role of retinoic acid in this process during *Xenopus* and amphioxus development. Tom then pursued a PhD at Sorbonne University, France, supervised by Dr Aude Dupre. During this period, he investigated the earliest steps of vertebrate development – meiotic division of female gametes. Using *Xenopus* oocytes as an experimental model to study molecular mechanisms of the cell cycle, he identified a new crucial role of the phosphatase PP2A-B55 in the signaling pathway leading to the activation of the Cdk1 kinase during meiosis resumption. By combining his expertise in biochemistry with genetic approaches, he showed that PP2A-B55 is needed to trigger meiotic resumption by dephosphorylating the protein Arpp19, a step that is necessary for Cdk1 activation. His discovery for the first time revealed PP2A as a positive regulator in the early steps of meiosis resumption in a vertebrate model (Lemonnier et al., 2021). After earning his PhD in 2019, Tom joined Binyam Mogessie's lab at the University of Bristol and then Yale University, where he continues to study the mechanisms of female meiosis in mammalian oocytes. Since joining the Mogessie lab, Tom has contributed to discovery of nuclear F-actin in mammalian oocytes (Scheffler et al., 2022) and is currently investigating variations in centromeric regions of meiotic chromosomes that might underly high incidence of oocyte aneuploidy at advanced reproductive ages.

Articles short-listed for the JCS Prize

Awasthi, M., Ranjan, P., Kelterborn, S., Hegemann, P. and Snell, W. J. (2022). A cytoplasmic protein kinase couples engagement of *Chlamydomonas* ciliary receptors to cAMP-dependent cellular responses. *J. Cell Sci.* **135**, jcs259814. doi:10.1242/jcs.259814

Chavez-Abiega, S., Grönloh, M. L. B., Gadella, T. W. J., Bruggeman, F.J. and Goedhart, J. (2022). Single-cell imaging of ERK and Akt activation dynamics and heterogeneity induced by G-protein-coupled receptors. *J. Cell Sci.* **135**, jcs259685. doi:10.1242/jcs.259685

Davidian, D., LeGro, M., Barghouth, P. G., Rojas, S., Ziman, B., Maciel, E. I., Ardell, D., Escobar, A. L. and Oviedo, N. J. (2022). Restoration of DNA integrity and the cell cycle by electric stimulation in planarian tissues damaged by ionizing radiation. *J. Cell Sci.* **135**, jcs259304. doi:10.1242/jcs.259304

Gallo, G. L., Valko, A., Herrera Aguilar, N., Weisz, A. D. and D'Alessio, C. (2022). A novel fission yeast platform to model N-glycosylation and the bases of congenital disorders of glycosylation type I. *J. Cell Sci.* **135**, jcs259167. doi:10.1242/jcs.259167

Genest, M., Comunale, F., Planchon, D., Govindin, P., Noly, D., Vacher, S., Bièche, I., Robert, B., Malhotra, H., Schoenit, A. et al. (2022). Upregulated flotillins and sphingosine kinase 2 derail AXL vesicular traffic to promote epithelial-mesenchymal transition. *J. Cell Sci.* **135**, jcs259178. doi:10.1242/jcs.259178

Guida, E., Tassinari, V., Colopi, A., Todaro, F., Cesarini, V., Jannini, B., Pellegrini, M., Botti, F., Rossi, G. Rossi, P. et al. (2022). MAPK activation drives male and female mouse teratocarcinomas from late primordial germ cells. *J. Cell Sci.* **135**, jcs259375. doi:10.1242/jcs.259375

Li, J. and Hochstrasser, M. (2022). Selective microautophagy of proteasomes is initiated by ESCRT-0 and is promoted by proteasome ubiquitylation. *J. Cell Sci.* **135**, jcs259393. doi:10.1242/jcs.259393

Noordstra, I., van den Berg, C. M., Boot, F. W. J., Katrukha, E. A., Yu, K. L., Tas, R. P., Portegies, S, Viergever, B. J., de Graaff, E., Hoogenraad, C. C. et al. (2022). Organization and dynamics of the cortical complexes controlling insulin secretion in β-cells. *J. Cell Sci.* **135**, jcs259430. doi:10.1242/jcs.259430

Papalazarou, V., Drew, J., Juin, A., Spence, H. J., Whitelaw, J., Nixon, C., Salmeron-Sanchez, M. and Machesky, L. M. (2022). Collagen VI expression is negatively mechanosensitive in pancreatic cancer cells and supports the metastatic niche. *J. Cell Sci.* **135**, jcs259978. doi:10.1242/jcs.259978

Schrader, T. A., Carmichael, R. E., Islinger, M., Costello, J. L., Hacker, C., Bonekamp, N. A., Weishaupt, J. H., Andersen, P. M. and Schrader, M. (2022). PEX11β and FIS1 cooperate in peroxisome division independently of mitochondrial fission factor. *J. Cell Sci.* **135**, jcs259924. doi:10.1242/jcs.259924

Schürmann, H., Abbasi, F., Russo, A., Hofemeier, A. D., Brandt, M., Roth, J., Vogl, T. and Betz, T. (2022). Analysis of monocyte cell tractions in 2.5D reveals mesoscale mechanics of podosomes during substrate-indenting cell protrusion. *J. Cell Sci.* **135**, jcs259042. doi:10.1242/jcs.259042

Tischer, T., Yang, J. and Barford, D. (2022). The APC/C targets the Cep152-Cep63 complex at the centrosome to regulate mitotic spindle assembly. *J. Cell Sci.* **135**, jcs259273. doi:10.1242/jcs.259273

Titialii-Torres, K. F. and Morris, A. C. (2022). Embryonic hyperglycemia perturbs the development of specific retinal cell types, including photoreceptors. *J. Cell Sci.* **135**, jcs259187. doi:10.1242/jcs.259187

Xu, A., Basant, A., Schleich, S., Newsome, T. P. and Way, M. (2023). Kinesin-1 transports morphologically distinct intracellular virions during vaccinia infection. *J. Cell Sci.* **136**, jcs260175. Epub Sep 30 2022. doi:10.1242/jcs.260175

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Scheffler, K., Uraji, J., Jentoft, I., Cavazza, T., Monnich, E., Mogessie, B. and Schuh, M. (2021). Two mechanisms drive pronuclear migration in mouse zygotes. *Nat. Commun.* **12**, 841. doi:10.1038/s41467-021-21020-x

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