

Sigolène Meilhac

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Head of the *Imagine*-Institut Pasteur Unit of Heart Morphogenesis with a joint appointment

-[Department of Developmental and Stem Cell Biology](#), Institut Pasteur

-IHU [Institut Imagine](#)-Inserm UMR1163, Université Paris Cité (UPC)

Cumulative supervision of 2 senior scientists, 13 post-docs, 9 PhD students, 6 technicians, 5 research engineers, 55 undergraduate students

EDUCATION

2011 HDR (Habilitation) of Biology at the University of Versailles-St Quentin-en-Yvelines
2003 PhD in developmental biology, University Paris XI- Supervisor M. Buckingham (Pasteur)
1999 Master in cellular and molecular biology, University of Paris XI
1996-2000 Ecole Normale Supérieure, Paris, France

PREVIOUS POSITIONS

2018 – 2024 DR2 (Directrice de recherche), INSERM
2014-2020 PI of the Junior group (G5), Institut Pasteur, Institut *Imagine*, INSERM UMR1163, UPC
2010 – 2018 CR1 (Chargée de Recherche), INSERM
2006 – 2009 CR2 (Chargée de Recherche), INSERM
2006 Visiting scientist, MRC Human Genetics Unit (Edinburgh, UK), K. Lawson lab
2004 – 2006 post-doctoral fellow, Wellcome Trust Gurdon Institute (Cambridge, UK), M Zernicka-Goetz lab

PRIZES AND FELLOWSHIPS

2024 Prize of the Fondation iXcore Exail iXlife pour la Recherche
2018 Pasteur Vallery-Radot Prize
2004-2006 Marie Curie Intra-European and EMBO long-term postdoctoral fellowships
2001-2003 FRM, AFM and French Ministry of Research PhD fellowships

REVIEW PANELS

2026-2031 External Advisory board of a Wellcome Trust consortium, UK
2024-now Post-doctoral fellowship panel, Fondation Lefoulon-Delalande
2022-2026 Deputy member CSS2 «Cancerology, genetic diseases», INSERM
2020-now Scientific council, Pasteur-Weizmann
2019-2024 Reviewing Editorial Board of the journal eLife, Developmental Biology

INSTITUTIONAL RESPONSIBILITIES

2021-2024 Deputy director, DSCB Department, Institut Pasteur, France
2020-2021 Steering committee on activity reduction at Institut Imagine during the COVID pandemic
2019-now Steering committee Filière nationale de santé CARDIOGEN
2015-now Founding member and coordinator of the Integrated Care and Research Programme on Cardiology at the IHU Imagine/Necker hospital

RECENT INVITED INTERNATIONAL SEMINARS

- 2026 HDBI and CoB Human Development: Stem Cells, Models, Embryos (UK)
AEPC Webinar - WG Morphology (online)
- 2025 SVRF Awardee Symposium (online)
58th AEPC meeting, Hamburg (Germany)
Yale School of Medicine, lecture, New Haven (USA)
- 2024 MRC Cambridge Stem Cell Institute, Cambridge (UK)
FASEB Biology of Cilia and Flagella Conference, St Paul (USA)
University of Copenhagen, Copenhagen (Dk)
- 2023 Hangzhou Heart Valve conference, Hangzhou (China)
75th Yamada Conference on Left-Right Asymmetry, Kobe (Japan)
- 2022 Imaging Mouse Development, Janelia Workshop, Ashburn (USA)
Meeting of the ISD and BSDB, La Valette (Malta)
Company of Biologists Workshop on Left-Right Patterning, Buxted (UK)
Cornell BBS Signature Seminar series, Ithaca (USA)
HoD Departmental Seminar, Oxford University (UK)
Nationwide Children's Hospital, Columbus (USA)
Helsinki Institute of Life Science, Helsinki (Finland)

ORGANISATION OF INTERNATIONAL MEETINGS

- 2023 ESC WG DAP Cardiovascular Development Conference, Paris
- 2023 satellite meeting of the European Congress for Developmental Biology, Paris
- 2019 International Conference on Cilia, Flagella and Centrosomes, Paris

TEACHING

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| 2025-now | Bergamo University, Italy |
| 2024-now | ENS Ulm, France |
| 2021-2026 | Sorbonne Université, France |
| 2020 | Prague Charles University, Czech Republic |
| 2019 | MOOC Advances in Stem Cell Biology (Institut Pasteur) |
| 2008-2020 | Institut Pasteur, France |
| 2000-2003, 2009-2022 | Université Paris Cité, France |

ONGOING GRANTS

- 2026-2028 FFC, partner
- 2026-2027 Tremplin ANR, PI
- 2025-2026 The SpliceFund, PI
- 2023-2028 Equipe FRM, PI
- 2021-2026 Chaire AXA Tête & Cœur at Institut Imagine, co-coordinator
- 2020-2027 ANR PIA, Labex Revive (Institut Pasteur), partner

PUBLICATIONS

ORCID 0000-0003-4080-2617

Original publications

- 2003 **Journal de la Société de Biologie**, 197(2) : 179-186, S. Meilhac, R. Kelly, D. Rocancourt et M. Buckingham, La souris comme modèle d'étude de la morphogenèse du cœur chez les mammifères : croissance et lignage des myocytes.
- 2003 **Development**, 130(16) : 3877-3889, S. Meilhac, R. Kelly, D. Rocancourt, S. Eloy-Trinquet, J.F. Nicolas and M. Buckingham, A retrospective clonal analysis of the myocardium reveals two phases of clonal growth in the developing mouse heart.
- 2004 **The Journal of Cell Biology**, 164(1) : 97-109, S. Meilhac, M. Esner, M. Kerszberg, J. Moss and M. Buckingham, Oriented clonal cell growth in the developing mouse myocardium underlies cardiac morphogenesis.
- 2004 **Developmental Cell**, 6(5) : 685-698, S. Meilhac, M. Esner, R. Kelly, J.F. Nicolas and M. Buckingham, The clonal origin of myocardial cells in different regions of the embryonic mouse heart.
- 2004 **Circulation Research**, 95(3):261-8, S. Zaffran, R. Kelly, S. Meilhac, M. Buckingham and N. Brown, Right ventricular myocardium derives from the anterior heart field.
- 2006 **Development**, 133(4):737-749, M. Esner, S. Meilhac, F. Relaix, J-F Nicolas, G. Cossu and M. Buckingham, Smooth muscle of the dorsal aorta shares a common clonal origin with skeletal muscle of the myotome.
- 2006 **Developmental Biology**, 294(2):366-75, D. Franco, S. Meilhac, V. Christoffels, A. Kispert, M. Buckingham and R. Kelly, Left and right ventricular contributions to the formation of the interventricular septum in the mouse heart.
- 2007 **Developmental Biology**, 309(1):97-112, M-E. Torres-Padilla, L. Richardson, P. Kolasinska, S. Meilhac, M. Luthe-Eversloh and M. Zernicka-Goetz, The anterior visceral endoderm of the mouse embryo is established from both preimplantation precursor cells and by de novo gene expression after implantation.
- 2007 **BMC Developmental Biology**, 7:96, A. Perea-Gomez*, S. Meilhac*, K. Piotrowska-Nitsche, D. Gray, J. Collignon, and M. Zernicka-Goetz, Regionalisation of the mouse visceral endoderm as the blastocyst transforms into the egg cylinder.
- 2008 **Developmental Biology**, 313(1):25-34, F. Bajolle, S. Zaffran, S. Meilhac, M. Dandonneau, T. Chang, R. Kelly and M. Buckingham, Myocardium at the base of the aorta and pulmonary trunk is prefigured in the outflow tract of the heart and in subdomains of the second heart field.
- 2009 **Developmental Biology**, 331(2):210-21, S. Meilhac, R. Adams, S. Morris, A. Danckaert, J-F. Le Garrec and M. Zernicka-Goetz, Active cell movements coupled to positional induction are involved in lineage segregation in the mouse blastocyst.
- 2010 **Circulation Research**, 107(1):153-61, L. Miquerol, N. Moreno-Rascon, S. Beyer, L. Dupays, S. Meilhac, M. Buckingham, D. Franco and R. Kelly, Biphasic Development of the Mammalian Ventricular Conduction System.
- 2010 **Development**, 137(19):3269-3279, F. Lescroart, R. Kelly, J-F. Le Garrec, J-F. Nicolas, S. Meilhac and M. Buckingham, Clonal analysis reveals lineage relationships between head muscles and second heart field derivatives in the mouse embryo.
- 2011 **Biomedical Imaging**: From Nano to Macro, 2011 IEEE International Symposium, pp.2113-2116, Chicago, 30March - 2April 2011, S. Pop, A. Dufour, J-F. Le Garrec, C. Ragni, M. Buckingham, S. Meilhac and J-C. Olivo-Marin, A fast and automated framework for extraction of nuclei from cluttered 3D images in fluorescence microscopy.

- 2012 **Circulation Research**, 111(10):1313-1322, F. Lescroart, T. Mohun, S. Meilhac, M. Bennet and M. Buckingham, A lineage tree for the venous pole of the heart : clonal analysis clarifies controversial genealogy based on genetic tracing.
- 2012 **Circulation Research**, 111(10):1323-1335, J. Domínguez Macías, S. Meilhac, Y. Bland, M. Buckingham and N.A. Brown, Asymmetric fate of the posterior part of the second heart field results in unexpected left/right contributions to both poles of the heart.
- 2013 **Development**, 140(2):395-404, J-F. Le Garrec, C. Ragni, S. Pop, A. Dufour, J-C. Olivo-Marin, M. Buckingham and S. Meilhac, Quantitative analysis of polarity in 3D reveals local cell coordination in the embryonic mouse heart.
- 2013 **Bioinformatics**, 29(6):772-9, S. Pop, A. Dufour, J-F. Le Garrec, C. Ragni, C. Cimper, S. Meilhac and J-C. Olivo-Marin, Extracting 3D cell parameters from dense tissue environments: Application to the development of the mouse heart
- 2013 **Developmental Dynamics**, 242(6):665-77, L. Miquerol, A. Bellon, N. Moreno, S. Beyer, S. Meilhac, M. Buckingham, D. Franco and R.G Kelly, Resolving cell lineage contributions to the ventricular conduction system with a Cx40-GFP allele: a dual contribution of the first and second heart fields.
- 2014 **WIREs Systems Biology and Medicine**, 6(6):389-97, B. de Boer, J-F. Le Garrec, V Christoffels, S. Meilhac* and J Ruijter*, Integrating multi-scale knowledge on cardiac development into a computational model of ventricular trabeculation.
- 2015 **Methods in Cell Biology** 127:55-73, ed R. Basto and W. Marshal, Elsevier Inc. (San Diego, USA), N. Diguët, J-F. Le Garrec, T. Lucchesi and S. Meilhac, Imaging and analysing primary cilia in cardiac cells.
- 2017 **Nature Communications**, 8:14582, C. Ragni, N. Diguët, J-F. Le Garrec, M. Novotova, T. Resende, Pop, N. Charon, L. Guillemot, L. Kitasato, C. Badouel, A. Dufour, J-C. Olivo-Marin, A. Trouvé, H. McNeill and S. Meilhac, Amotl1 mediates sequestration of the Hippo effector Yap1 downstream of Fat4 to restrict heart growth.
- 2017 **eLife**, 6:e28951, J-F. Le Garrec, J. Domínguez Macías, A. Desgrange, K. Ivanovitch, E. Raphaël, J.A. Bangham, M. Torres, E. Coen, T. Mohun and S. Meilhac, A predictive model of asymmetric morphogenesis from 3D reconstructions of mouse heart looping dynamics.
- 2019 **Disease Models & Mechanisms**, 12(7):dmm038356, A. Desgrange, J. Lokmer, C. Marchiol, L. Houyel and S. Meilhac, Standardised imaging pipeline for phenotyping mouse laterality defects and associated heart malformations, at multiple scales and multiple stages.
- 2020 **Cell Reports**, 32(3):107932, M Peralta, L Ortiz Lopez, K Jerabkova, T Lucchesi, B. Vitre, D Han, L Guillemot, C Dingare, I Sumara, N Mercader, V Lecaudey, B. Delaval, S. Meilhac and J Vermot, Intraflagellar transport complex B proteins regulate the Hippo effector Yap1 during cardiogenesis.
- 2020 **Developmental Cell**, 55(4):413–431, A. Desgrange, J-F. Le Garrec, S. Bernheim, T. Bønnelykke and S. Meilhac, Transient Nodal signalling in left precursors coordinates opposed asymmetries shaping the heart loop.
- 2021 **IEEE ISBI**, 315220; 258, 13-16 April 2021, R. Sarkar, D. Darby, H. Foucambert, S. Meilhac and J-C Olivo-Marin, NU3D: 3d nuclei segmentation from light-sheet microscopy images of the embryonic heart
- 2022 **Biological Imaging**, 2: e2, R. Sarkar, D. Darby, S. Meilhac and J-C Olivo-Marin, 3D Cell Morphology Detection by Association for Embryo Heart Morphogenesis.
- 2022 **Nature Cardiovascular Research**, 1:504–517, I. Esteban, P. Schmidt, A. Desgrange, M. Raiola, S. Temiño, S. Meilhac, L. Kobbelt and M. Torres, Pseudo-dynamic analysis of heart tube formation in the mouse reveals strong regional variability and early left-right asymmetry
- 2023 **Experimental & Molecular Medicine**, 55(1):228-239, Palmquist-Gomes P, Ruiz-Villalba A, Guadix JA, Romero JP, Bessières B, MacGrogan D, Conejo L, Ortiz A, Picazo B, Houyel L,

- Gómez-Cabrero D, Meilhac S, de la Pompa JL, Pérez-Pomares JM, Origin of congenital coronary arterio-ventricular fistulae from anomalous epicardial and myocardial development
- 2023 **Developmental Cell**, 58(21):2217-2234, S. Bernheim, A. Borgel, J-F. Le Garrec, E. Perthame, A. Desgrange, C. Michel, L. Guillemot, S. Sart, C. Baroud, W. Krezel, F. Raimondi, D. Bonnet, S. Zaffran, L. Houyel and S. Meilhac, Identification of Greb11 as a genetic determinant of criss-cross heart in mice showing torsion of the heart tube by shortage of progenitor cells
- 2024 **Nature Communications**, 15(1):1982, C. Soudais, R. Schaus, C. Bachelet, N. Minet, S. Mouasni, C. Garcin, C. Lopes Souza, P. David, C. Cousu, H. Asnagli, A. Parker, P. Palmquist-Gomes, F. Sepulveda, S. Storck, S. Meilhac, A. Fischer, E. Martin and S. Latour, Inactivation of cytidine triphosphate synthase 1 prevents fatal auto-immunity in mice
- 2025 **PLOS Biology**, 23(3): e3002598, T. Holm Bønnelykke, M-A. Chabry, E. Perthame, G. Dombrowsky, F. Berger, S. Dittrich, M-P. Hitz, A. Desgrange* and S. Meilhac*, Notch3 is an asymmetric gene and a modifier of heart looping defects in Nodal mouse mutants
- 2025 **Science Advances**, 11(38):eads8192, A. Desgrange, E. Perthame, C. Marchiol, D. Madec, L. Guillemot, M-A. Chabry, M. El Beheiry, J-B. Masson, O. Raissy, S. Bernheim, L. Houyel and S. Meilhac, Plasticity of ventricle position after heart looping in heterotaxy with right isomerism
- 2025 **Orphanet J Rare Dis**, 20(1):601, S. Bernheim, A. Borgel, V. Pingault, S. Lyonnet, D. Bonnet, S. Meilhac* and L. Houyel*, Criss cross heart: an outflow tract defect?
- 2025 **Commun Biol**, 8(1):1809, H. Nguyen, A. Desgrange, A. Ochandorena-Saa, V. Benhamo, S. Bernheim, L. Houyel, S. Meilhac* and C. Zimmer*, Deep learning-based detection of murine congenital heart defects from μ CT scans
- 2025 **BIORXIV/2025/674213** P. Palmquist-Gomes, G. Letort, AU. Hegde, JM Pérez-Pomares and S. Meilhac, VANGl2 shapes the mouse heart tube from adjacent epithelia without planar polarity,
- 2026 **Science Advances**, 12(30):eadx6486, A. Ochandorena-Saa, E. Perthame, Z. Oulerich, A. Chamolly, T. Blisnick, J. Lokmer, C. Rouillon, P. Bastin and S. Meilhac, Wnt and Nodal asymmetries stratify mouse laterality phenotypes in the absence of node flow

Reviews, chapters and editorial

- 2003 **Journal of Anatomy**, 202 : 59-68, M. Buckingham, L. Bajard, T. Chang, P. Daubas, J. Hadchouel, S. Meilhac, D. Montarras, F. Relaix, D. Rocancourt, The formation of skeletal muscle : from somite to limb.
- 2005 **Nature Reviews Genetics** 6(11):826-37, M. Buckingham, S. Meilhac* and S. Zaffran*, Building the mammalian heart from two sources of myocardial cells.
- 2007 chapter 10 : 201 215 for the book entitled **Principles of Developmental Genetics**, 1st ed S. Moody, Academic Press, Elsevier Inc. (San Diego, USA). S. Meilhac, Anterior-posterior patterning in mammals.
- 2009 editorial for **Circulation Research** 104(11):1235-1237, R. Harvey, S. Meilhac and M. Buckingham, Landmarks and lineages in the developing heart.
- 2010 chapter 3.1:195-217 for the book entitled **Heart Development and Regeneration**, ed N. Rosenthal and R. Harvey, Elsevier Inc. (San Diego, USA). S. Meilhac and M. Buckingham, The behaviour of cells that form the myocardial compartments of the vertebrate heart
- 2011 **Developmental Cell** 21(3):394-409, M. Buckingham* and S. Meilhac*, Tracing cells for tracking cell lineage and clonal behaviour.
- 2012 chapter 15:263-289 for the book entitled **Mouse Development – From Oocyte to Stem Cells**, series Results and Problems in Cell Differentiation 55, ed J.Z. Kubiak, Springer Verlag (Heidelberg, Germany), F. Lescroart and S. Meilhac, Cell lineages, growth and repair of the mouse heart.

- 2014 **Cold Spring Harbor Perspectives in Medicine** 4(9):a013888, S. Meilhac, F. Lescroart, C. Blanpain and M. Buckingham, Cardiac cell lineages that form the heart.
- 2014 chapter 10:171-188 for the book entitled **Principles of Developmental Genetics**, 2nd ed S. Moody, Academic Press, Elsevier Inc. (San Diego, USA). A. Perea-Gomez and S. Meilhac, Formation of the Anterior-Posterior axis in Mammals.
- 2014 **Médecine/Sciences** 30(11):996-1003, N. Diguët and S. Meilhac, Cils et morphogénèse cardiaque.
- 2015 **Cilia** 4:5, A. Benmerah, B. Durand, R. Giles, T. Harris, L. Kohl, C. Laclef, S. Meilhac, H. Mitchison, D. Norris, L. Pedersen, R. Roepman, P. Swoboda, M. Ueffing and P. Bastin, The more we know, the more we have to discover: an exciting future for understanding cilia and ciliopathies.
- 2018 chapter 3:73-91 for the book entitled **Cilia: Development and Disease**, ed Paraskevi Goggolidou, Science Publishers/Taylor and Francis, LLC, S. Meilhac, The role of cilia in heart development and disease
- 2018 chapter 9:75-85 for the book entitled **The ESC book on Cardiovascular Development**, ed ESC Working Group on Development, Anatomy and Pathology, S. Meilhac, Cardiac growth I: Cardiomyocyte proliferation
- 2018 **Nature Reviews Cardiology** 5(11):705-724, S. Meilhac* and M. Buckingham*, The deployment of cell lineages that form the mammalian heart
- 2018 **Development** 145(22):dev162776 doi10.1242, A. Desgrange, J-F. Le Garrec, and S. Meilhac, Left-right asymmetry in heart development and disease : forming the right loop
- 2019 chapter 57:473-480 for the book entitled **Biologie cellulaire et moléculaire du système cardiovasculaire**, Publisher John Libbey Eurotext, 3d ed. GRRC/SFC, C. Duplâa* and S. Meilhac*, Voie de la polarité planaire : importance dans la formation des vaisseaux et du cœur.
- 2020 **Philosophical Transactions of the Royal Society B** 375(1809):20190556, S. Bernheim and S. Meilhac, Mesoderm patterning by a dynamic gradient of retinoic acid signalling.
- 2021 **Annual Review of Genomics and Human Genetics** 22:257:284, L. Houyel and S. Meilhac, Heart Development and Congenital Structural Defects.
- 2022 **Current Opinion in Genetics & Development** 73:101896, P. Palmquist-Gomes and S. Meilhac, Shaping the mouse heart tube from the second heart field epithelium.
- 2024 chapter 7:101-123 for the book entitled **Kaufman's Atlas of Mouse Development Supplement**, 2nd ed S. Srinivas and G. Morriss-Kay, Academic Press, Elsevier Inc. (San Diego, USA). A. Ochandorena-Saa, R. Tyser and S. Meilhac, Spatiotemporal dynamics of mouse heart tube development
- 2024 chapter 8:125-144 for the book entitled **Kaufman's Atlas of Mouse Development Supplement**, 2nd ed S. Srinivas and G. Morriss-Kay, Academic Press, Elsevier Inc. (San Diego, USA). S. Meilhac, S. Zaffran, S. Bernheim, T.J. Mohun, N.A. Brown and R.H. Anderson, Establishment of a double blood circulation in the developing mouse heart
- 2026 **FEBS Letters**, in press, S. Bernheim, M. Tortigue, S. Igor Travisano, F. Kyndt, F. Ebstein, V. Forest, S. Meilhac, J-J Schott and A-E. Baruteau, From outflow tract development to ventriculo-arterial discordance - Developmental and genetic mechanisms of d-TGA and ccTGA.