Curriculum Vitae of James Sharpe

Personal Information

Name:	Sharpe, James	EMBL Barcelona
Date of birth:	29th June 1970	PRBB
Nationality:	British	Dr. Aiguader, 88
Email:	james.sharpe@embl.es	08003 Barcelona, Spain
Web-page:	https://www.embl.es/research/unit/sharpe/index.html	

Current Positions

- Head of EMBL Barcelona.
- Senior Group Leader.
- ICREA Research Professor.

Statement of Research Interests:

(1) To further our understanding of organogenesis as a complex system, by bringing together a diverse range of techniques from biology, physics, imaging and computer science. The larger part of the Sharpe lab focuses on a well-characterised standard model of development – the vertebrate limb (using both mouse and chick). For this project we construct computer simulations (Rushi et al, *Science* 2012, Raspopovic et al, *Science* 2014, Onimaru et al. *Nature Communications* 2016) which are based on high-quality quantitative empirical data generated by our own new 3D and 4D imaging technologies.

(2) Building on the success of the 3D imaging technique developed within the lab called Optical Projection Tomography (OPT – Science 296:541, 2002), the other major goal of the lab is to continue developing and improving 3D and 4D imaging technology. Recent success in this direction includes the development of time-lapse OPT imaging of mouse limb development in-vitro (Nature Methods 5:609-12, 2008).

(3) In addition to these data-driven approaches, a smaller but equally important set of projects explores the more theoretical aspects of gene circuit dynamics in tissues (Jimenez et al. *Molecular Systems Biology* 2017), pattern formation (Marcon et al. *eLife* 2016) and swarm robotics.

Education

1992	Degree in Pure & Applied Biology, University of Oxford, UK.
1997	PhD in Genetics & Development, MRC National Institute for Medical Research, London, UK. Supervisor: Dr. Robb Krumlauf Projects: Regulation of *Hoxb* genes, and polydactyly in mice.

Career

1997 – 1998	Postdoctoral Fellow, University of Chile, Santiago, Chile.
1998 – 2000	Postdoctoral Fellow, MRC Human Genetics Unit, Edinburgh, UK.
2000	*3 month post-doctoral visit to Mt. Sinai School of Medicine, New York, USA.*
2002	*4 month post-doctoral visit to National Centre for Biotechnology, Madrid.*
2002 – 2006	Tenure-track Group Leader, MRC Human Genetics Unit, Edinburgh, UK.
2006 – 2017	Senior Group Leader at Centre for Genomic Regulation (CRG), Barcelona, Spain.
2006 –	ICREA Research Professor, Barcelona, Spain.
2011 – 2014	Acting coordinator of CRG Systems Biology Program.
2014 – 2017	Coordinator of CRG Systems Biology Program.
2017	Head of EMBL Barcelona

Scientific highlights from our primary research topics

(A) Systems Modelling of Limb Development

- P Germann et al. (2019) ***Cell Systems*** 8(3), 261-266
  ya|| a: GPU-powered Spheroid Models for Mesenchyme and Epithelium.
- K Onimaru *et al.* (2016) ***Nature Communications*** 7, 11582
  The fin-to-limb transition as the re-organization of a Turing pattern.
- M Uzkudun *et al.* (2015) ***Molecular Systems Biology*** 11, 815.
  Data-driven modelling of a gene regulatory network for cell fate decisions in the growing limb bud.
- J Raspopovic *et al.* (2014) ***Science*** 345 (6196), 566-570.
  Digit patterning is controlled by a Bmp-Sox9-Wnt Turing network modulated by morphogen gradients
- R Sheth *et al.* (2012) ***Science*** 338 (6113), 1476-148.
  Hox genes regulate digit patterning by controlling the wavelength of a Turing-type mechanism
- L Marcon *et al.* (2011) ***PLoS Computational Biology*** 7 (2), e1001071.
  A computational clonal analysis of the developing mouse limb bud
- B Boehm *et al.* (2010) ***PLoS Biology*** 8 (7), e1000420.
  The role of spatially controlled cell proliferation in limb bud morphogenesis.

(B) Theory of multi-cellular gene regulatory circuits

- A Jimenez *et al.* (2017) ***Molecular Systems Biology*** 13(4), 925
  A spectrum of modularity in multi-functional gene circuits.
- L Marcon *et al.* (2016) ***eLife*** 5. doi: 10.7554/eLife.14022
  High-throughput mathematical analysis identifies Turing networks for patterning with equally diffusing signals.
- J. Cotterell *et al.* (2015) ***Cell Systems*** 1 (4), 257-269.
  A Local, Self-Organizing Reaction-Diffusion Model Can Explain Somite Patterning in Embryos.
- A Jimenez *et al.* (2015) ***PNAS*** 112, 2103-2108.
  Dynamics of gene circuits shapes evolvability.
- Y Schaerli *et al.* (2014) ***Nature Communications*** 5:4905.
  A unified design space of synthetic stripe-forming networks.
- J Cotterell & J Sharpe (2010) ***Molecular Systems Biology*** 6 (1).
  An atlas of gene regulatory networks reveals multiple 3-gene mechanisms for interpreting morphogen gradients

(C) 3D Mesoscopic Imaging

- J Mayer J *et al.* (2018). ***Light Sci Appl*** 7 doi: 10.1038/s41377-018-0068-z
  Attenuation artifacts in light sheet fluorescence microscopy corrected by OPTiSPIM.
- J Mayer *et al.* (2014) ***Optics Letters*** 39 (4), 1053-1056.
  OPTiSPIM: integrating optical projection tomography in light sheet microscopy
- J Swoger *et al.* (2011) ***Journal of Biophotonics*** 4 (1- 2), 122-134.
  4D retrospective lineage tracing using SPIM for zebrafish organogenesis studies
- MJ Boot *et al.* (2008) ***Nature Methods*** 5 (7), 609-612.
  In vitro whole-organ imaging: 4D quantification of growing mouse limb buds.
- T Alanentalo *et al.* (2007) ***Nature Methods*** 4 (1), 31-33.
  Tomographic molecular imaging and 3D quantification within adult mouse organs.
- J. Sharpe *et al.* (2002) ***Science*** 296, 541. ***881 citations***
  Optical projection tomography as a tool for 3D microscopy and gene expression studies

(D) Morphometrics

- N Martínez-Abadías *et al.* (2016) ***Systematic Biology*** 65: 194-211
  Geometric Morphometrics on Gene Expression Patterns Within Phenotypes: An Example on Limb Development
- B Boehm *et al.* (2011) ***Development*** 138(6):1227-34.
  A landmark-free morphometric staging system for the mouse limb bud.

Fellowships and Awards

2000	MRC Career Development Award
2002	EMBO Short-term fellowship
2006	Royal Photographic Society – Selwyn Award (for invention of OPT)
2006	ICREA Research Professor
2008	Wellcome Trust Images Award – Special Award of Excellence
2019	EMBO member

Grants

2007 – 2010	Minesterio de Educación y Ciencia, MEC (Mecanismos celulares de crecimiento de patas vertebradas)
2011 – 2014	MINECO (Biología de sistemas para entender los mecanismos celulares y moleculares del desarrollo de patas vertebradas)
2013 – 2016	European Commission FP7 Programme (A theoretical framework for swarms of GRN-controlled agents which display)
2015 - 2020	ERC Advanced - SIMBIONT, European Council Research (A data-driven multiscale simulation of organogenesis)
2016 - 2019	LIMB-NET, MINECO (Análisis sistemático de redes genéticas en biología del desarrollo de extremidades)
2017 – 2018	Becas Leonardo 2016, Fundación BBVA (Non-invasive facial biomarkers of mental illness)
2017 – 2022	Sinergia, Swiss National Science Foundation (Reaction-diffusion networks underlying pattern formation of lymphoid tissue)
2018 – 2021	International Human Frontier Science Program Organization (Integrative analysis of the role of mammalian Hox genes in tissue patterning)
2018 – 2019	Beatriu de Pinòs, AGAUR (Microfluidics-based mechanobiology and patterning studies of vascularized morphogenesis models of limb development)
2020 – 2023	LIMBNET-3D, MINECO (Community modelling of limb morphogenesis in 3D)

Teaching Activities

2008, 2010	EMBO Practical Course on 3D Developmental Imaging (Oeiras, Portugal).
2009 – 2014	UPF university, Masters Course on Biomedicine, 3 lectures in the Systems Biology Module.
2010 – 2015	Co-organiser of the CRG Summer School – Modelling for Systems Biology (Barcelona).
2012	EMBO Global Exchange Lecture Course – Logic of Regulatory Circuits (Taiwan).
2013	EMBO Practical Course on Multi-level Modelling of Morphogenesis (Norwich, UK).
2017	UPF Masters course – Modelling (Barcelona, Spain)
2017	Kings College London Seminar Series – Spanning the Scales: Modelling limb bud development from molecular circuits to organogenesis (Longon, UK)
2018	CABD – Computer modelling of growth and form in the developing limb bud (Seville, Spain)
2018	Grand Séminaires du Collège de France – The grand challended of multicellular systems (Paris, France)
2018	Weizmann Institute, Seminar – Atlases of structure-function relationships in small motifs: the limits of modularity and Spanning the Scales: Computer modelling of growth and form in the developing limb bud (Tel-Aviv, Israel)
2018	UBICS seminars – Limb development, Turing patterns and computer modelling (Barcelona, Spain)

2019 IRB seminar – Life out of a limb (Barcelona, Spain)
2019 Venice Summer school: Mechanisms in development and evolution – Gene circuits underlying self-organised skeletal patterning, from sharks to mammals (Venice, Italy)
2019 Predoc Course at EMBL Heidelberg – Computational modelling of developing organs (Heidelberg, Germany)
2020 Podcast at the Stem Cells @ Lunch Digested at Kings College from London - What about the horse part? (Virtual)
2020 Online summer school at the Lorentz Center, Math Leiden University: Modelling shape and size in biological development - What about the horse part? Turing patterns on Turing machines(Virtual).

Granted Patents

- WO 2,004,020,997 Optical Projection Tomography (12-3-2004)
- EP 1,532,443 Optical Projection Tomography (25-5-2005)
- EP 1,516,183 Treatment of Tissue Specimens (11-4-2007)
- US 7,218,393 Rotary stage for imaging a specimen (15-5-2007)
- EP 1,530,073 Optical projection tomography apparatus with rotary stage for imaging (2007)

Commentaries on our work in Journals and Media

Raspopovic et al. (2014) *Science* 345: 566

- **In Turing's hands—the making of digits.** ***Science*** *345:516*
- **How did you get five fingers?** ***National Geographic***
- **How the zebra got its stripes, with Alan Turing** ***Welcome's Mosaic magazine***
- **Turing patterns show their hand in finger formation** ***Royal Society of Chemistry***
- **Interview for** ***BBC Radio 5 live Science***
- **Interview for** ***Radio Catalunya*** (in Catalan/Spanish)
- **Mystery of how we got our fingers and toes solved.** ***Daily Mail***
- **Interview for Catalan TV Science Program** ***Que Qui Com*** (in Catalan/Spanish)

Sheth et al. (2012) *Science* 338:1476

- **Turing Pattern Fingered for Digit Formation**. ***Science 338:1406***
- **Turing and Wolpert Work Together During Limb Development**. ***Sci. Signal. 6:pe14***

Marcon et al. (2011) *PLoS Computational Biology* 7 (2), e1001071

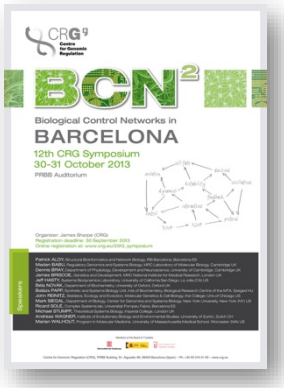
- **Budding Potential.** ***Nature Reviews Genetics*** 12:230

Boehm et al. (2010) *PLoS Biology* 8(7), e1000420

- **Limbs made to measure.** ***PLoS Biology*** 8(7), e1000421
- **The shape of life: Biology's biggest mystery.** ***New Scientist (1 Sep 2012) 2880:38***

Organisation of Symposia and Conferences

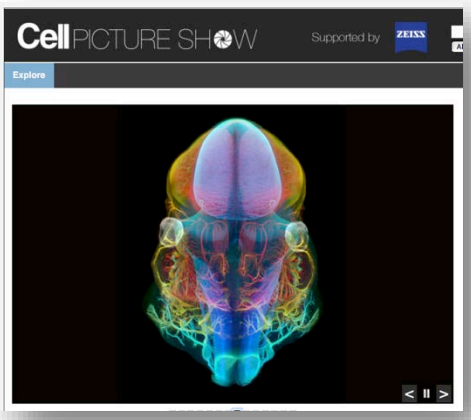
- **BCN²** Biological Control Networks in Barcelona. **Organiser.** Oct 2013
- Computational Approaches to Networks, Cells and Tissues. **Co-organiser**. April 2013
- I was one of the 2 main organisers of the ICSB 2016 (International Conference for Systems Biology), which is the primary annual event for the global systems biology community.

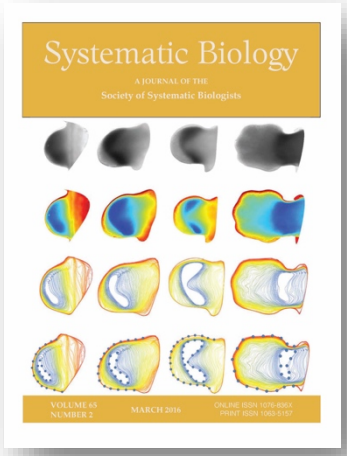


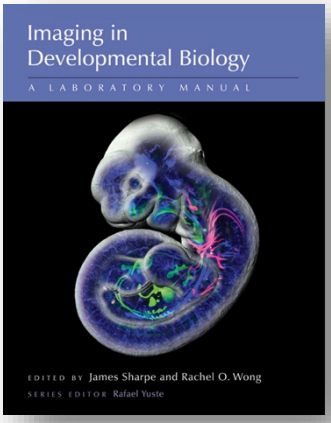
- **Co-Organiser of CRG Systems Biology Summer School (2011-2015)**. Very popular course open to the international community, on ***dynamical modelling***. 24 students per year. Co-sponsored by SystemsX.
- **Co-organiser of the Barcelona Biomed Conference:** Morphogenetic engineering (Nov. 2017; link)
  I was one of the 2 main organisers together with Marco Milán from IRB
- **Inauguration Symposium EMBL Barcelona Tissue Biology and Disease Modelling organiser** (Oct. 2018, link)
  First institutional event organised by EMBL Barcelona at the PRBB to officially introduce the new Unit to the community with the participation of institutional representatives in Spain.
- **Co-Organiser of the119th International Titisee Conference in Swtizerland** (March 2019, link): Tissue formation and regeneration: from molecules to models (From molecules to models: putting it all together)
  Member of the organising committee together with Elly Tanaka (Research Institute of Molecular Pathology, Viena, Austria) and Peter Reddien (MIT, Dept. Biology, Cambridge, MA, USA)
- **Co-organiser of the EMBO|EMBL Symposia Synthetic Morphogenesis: from gene to circuits to tissue architecture** in EMBL Heidelberg (March 2029, link)
- **EMBO Workshop: Limb development and regeneration** (July 2019, link)
  Organising the first workshop of EMBL Barcelona, with EMBO funding, i with Miguel Torres (CNIC, Spain) and Marian Ros (Universidad de Cantabria, Spain)
- **Co-organiser of the 3rd EMBL Partnership Conference "Perspectives in Translational Medicine"** (Sept. 2019, link) at the PRBB (Barcelona)
- **Co-organiser of the stop over fort Tara Oceans in Barcelona** (Oct. 2019, link)
  Institutional event that took place to showcase EMBL, the research activities of EMBL Barcelona, EMBL-Tara interactions as well as engage with high-level institutional and scientific representatives in Spain.
- **Hosting the EMBL in Spain at the PRBB** (Oct. 2019, link)
- **Chair of the EMBL-IBEC Winter Conference on Engineering Multicellular Systems** in Barcelona (Feb. 2020, link)
  EMBL-IBEC co-organised conference. The conference will focus on how engineering multicellular living systems is boosting our understanding of tissue and organ function, with applications in disease modelling, drug screening, and tissue engineering.
- **Co-organiser Virtual Workshop on Theory of Multicellular Organisation** (Nov 2019)

Dissemination of our mesoscopic imaging

Our imaging work has also been selected for numerous front covers, and competitions, such as the Royal Photographic Society (2013), Cell Picture Show (2013) and the Nikon Small World in Motion Competition (1st prize 2014).







Invited Presentations (2005-2020):

>40 invitations to speak at international conferences, >30 invitations to give seminars at departments/institutes, and 5 invitations to teach on internationally-recognised courses,
Including:

- July 2020 Seminar at EMBL Heidelberg, Gemrany (Virtual) - What about the horse part?
- Feb 2020 IDIBAPS Seminar – Brief introduction to EMBL BCN, tissue biology and disease modelling (Barcelona, Spain)
- Nov 2019 EMBL in the USA 2019 Symposium: The future of transcontinental science, California, USA - "In silico modelling of organogenesis"
- Oct 2019 European Developmental Biology Congress, Alicante, Spain - One growth and form of the limb dud
- July 2019 EMBO Workshop: Limb Development and Regeneration, Barcelona, Spain - "LIMB-NET: An online simulation tool for the limb, development community "
- June 2019 Developmental Biology Gordon Research Conference, USA - "50(+1) Years of the French Flag Problem"
- March 2019 119th International Titisee Conferences, Titisee, Switzerland - From molecules to models: putting it all together
- March 2019 Synthetic Morphogenesis: from gene circuits to tissue architecture, Heidelberg, Germany - From circuits to organs: towards a dynamic computer simulation of limb development
- March 2019 Image-based Modelling and Simulation of Morphogenesis, Dresden, Germany - Image-based modelling of development of the vertebrate limb (Towards a multi-scale model of vertebrate limb development)
- Feb 2019 Crick Developmental Biology Symposium, London, UK - From circuits to organs: Towards a dynamic computer simulation of limb development
- Nov 2018 Genes, development and populations conference, Edinbrugh, UK - Modelling Morphogenesis: Out on a Limb
- Nov 2018 19th International Conference on Systems Biology 2018, Lyon, France -
- Sept 2018 VPH-2018, Zaragoza, Spain - Image-driven modelling of limb development
- July 2018 ESOF Meeting - EMBL Round Table session, Toulouse, France - What would it take to re-grow a limb?
- Nov 2017 Barcelona BioMed Conference, Barcelona, Spain - Morphogenetic engineering
- Nov 2017 XXIX Developmental Biology Meeting, Barcelona, Spain - Dynamic computer modeling to span the scales: from molecular circuits to organogensis
- Nov 2017 EPFL Symposium, Lausanne, Switzerland - Engineering multicellular self-organization
- Oct. 2017 EMBO Conference
- Oct 2017 EPFL Computational Biology Symposium, Lausanne, Switzerland (Understanding Biology through Computation)
- July 2017 14th Limb Development and Regeneration meeting, Edinburgh, UK - "Computer modelling of gene circuits to understand the dynamics ofpatterning"
- July 2017 International conference on Intelligent Systems for Molecular Biology (ISMB)/ European Conference on Computational Biology (ECCB), Prague, Czech Republic - "Dynamic computer modeling to span the scales: from molecular circuits to organogensis."
- Jan 2017 SICB Annual meeting, New Orleans, USA- Changing while staying the same: Self-organized patterning allows a deeply-conserved gene circuit to produce varying skeletal arrengements during limb evolution
- Nov 2016 EMBL blue seminar, Heidelberg, Germany - "Image-driven modelling of organogenesis: Putting it all together"
- Nov 2016 Engineering the embryo beyond Systems Biology, Paris, France- "Morphogenetic engineering"
- Nov 2016 BDebate - Imaging for Life. From Molecules to Diagnostics and Therapy, Barcelona (Spain) - "OPTiSPIM: Getting the best of both worlds"

- Oct 2016 Modeling Cellular Processes in Space and Time, France – EMBO practical course: Image Driven Multiscae Modelling of Limb Development
- July. 2016 6th meeting of the European Society for Evolutionary Developmental Biology, Uppsala, Sweden.
- June 2016 Perspectives in Translational Medicine - Personalised Medicine, Heidelberg, DE.
- June 2016 CIG Symposium: "From a single cell to a complex organism", Lausanne, France.
- April 2016 BSTE 2016 - 4th Belgian Symposium on Tissue Engineering, Leuven, Belgium.
- Dec. 2015 Colloquium on "Modeling in Cell and Developmental Biology", Paris, France.
- Nov. 2015 EMBL|Stanford Conference: Personalised Health, Heidelberg, DE.
- Oct. 2015 Functional Genomics & Systems Biology: From Model Organisms to Human Health, Hinxton, UK.
- Oct. 2015 EMBO|EMBL Symposium: Seeing is Believing - Imaging the Processes of Life, Heidelberg, DE.
- Nov. 2014 Lyon SysBio Meeting, Lyon, France.
- Dec. 2013 Quantitative Methods in Gene Regulation, Cambridge, UK.
- June 2013 EMBO Workshop – Morphogen Gradients, Oxford, UK.
- June 2013 Presidential Symposium of the 17th International Society for Developmental Biology, Mexico.
- April 2013 Harvard Systems Biology Department, Boston, USA.
- July 2012 4th International Congress on Stem Cells and Tissue Formation, Dresden, Germany.
- June 2012 Turing Centenary Conference, Cambridge, UK.
- April 2012 Annual Meeting of the American Association of Anatomists, San Diego, USA.
- Sep. 2011 Mouse Molecular Genetics, Hinxton, UK.
- June 2011 Basel Computational Biology Conference on Multiscale modelling, Basel, Switzerland.
- June 2010 43rd Annual Meeting for the Japanese Society of Developmental Biologists, Kyoto, Japan.
- April 2010 EuroSyStem Bioimaging Workshop, Paris, France.
- Sep. 2009 Two invited presentations at the 16th ISDB, Edinburgh, UK.
- June 2009 EMBO Young Scientists Forum, Zagreb, Croatia.
- May 2009 Symposium: from a cell biology and biophysics perspective, CNIC, Madrid, Spain.
- Nov. 2008 Workshop at Mathematical Biosciences Institute, The Ohio State University, Columbus, USA.
- Nov. 2007 European Conference on Synthetic Biology (ECSB), St.Feliu Guíxols, Spain.
- Nov. 2006 Physics of Living Matter, Cambridge, UK.

Full list of publications

** corresponding author*

1. "Llambrich S, Wouters J, Himmelreich U, Dierssen M, Sharpe J, Gsell W, Martínez-Abadías N, Vande Velde G. (2020). **ViceCT and whiceCT for simultaneous high-resolution visualization of craniofacial, brain and ventricular anatomy from micro-computed tomography**. Sci Rep 10(1) doi: 10.1038/s41598-020-75720-3"
2. "Hahn M, van Krieken PP, Nord C, Alanentalo T, Morini F, Xiong Y, Eriksson M, Mayer J, Kostromina E, Ruas JL, Sharpe J, Pereira T, Berggren PO, Ilegems E, Ahlgren U. (2020). **Topologically selective islet vulnerability and self-sustained downregulation of markers for β-cell maturity in streptozotocin-induced diabetes**. Commun Biol 3(1) doi: 10.1038/s42003-020-01243-2"
3. "Oriola D, Marin-Riera M, Aalderink G, Anlas K, Gritti N, Sharpe J, Trivedi V. (2020), **Arrested coalescence of multicellular aggregates.** arXiv.org doi: https://arxiv.org/abs/2012.01455"
4. "Cotterell J, Vila-Cejudo M, Batlle-Morera L, Sharpe J. (2020). **Endogenous CRISPR/Cas9 arrays for scalable whole-organism lineage tracing**. Development 147(9) doi: 10.1242/dev.184481"
5. "Stolp B, Thelen F, Ficht X, Altenburger LM, Ruef N, Inavalli VVGK, Germann P, Page N, Moalli F, Raimondi A, Keyser KA, Jafari SMS, Barone F, Dettmer MS, Merkler D, Sharpe J, Iannacone M, Fackler OT, Schlapbach C, Stein JV, Nägerl UV. (2020). **Salivary gland macrophages and tissue-resident CD8+ T cells cooperate for homeostatic organ surveillance.** Sci Immunol 5(46) doi: 10.1126/sciimmunol.aaz4371"

6. "Sharpe J. (2019). **Wolpert's French Flag: what's the problem?** Development 146(24) doi: 10.1242/dev.185967"
7. "Marco Musy, Kevin Flaherty, Jelena Raspopovic, Alexandre Robert-Moreno, Joan T. Richtsmeier, James Sharpe, **A quantitative merthod for staging mouse embryos based on limb morphometry.** Published by The Company of Biologists Ltd | Development (2018) https://doi.org/10.1242/dev.154856"
8. "Diego X, Marcon L, Muller P, Sharpe J. (2018). **Key Features of Turing Systems are Determined Purely by Network Topology.** Phys Rev X 8(2) doi: 10.1103/PhysRevX.8.021071"
9. "Moalli F, Ficht X, Germann P, Vladymyrov M, Stolp B, de Vries I, Lyck R, Balmer J, Fiocchi A, Kreutzfeldt M, Merkler D, Iannacone M, Ariga A, Stoffel MH, Sharpe J, Bähler M, Sixt M, Diz-Muñoz A, Stein JV. (2018). **The Rho regulator Myosin IXb enables nonlymphoid tissue seeding of protective CD8+ T cells.** J Exp Med 215(7):1869-1890. doi: 10.1084/jem.20170896"
10. "Schaerli Y, Jiménez A, Duarte JM, Mihajlovic L, Renggli J, Isalan M, Sharpe J, Wagner A. (2018). **Synthetic circuits reveal how mechanisms of gene regulatory networks constrain evolution.** Mol. Syst. Biol. 14(9) doi: 10.15252/msb.20178102"
11. "Martínez-Abadías N, Mateu Estivill R, Sastre Tomas J, Motch Perrine S, Yoon M, Robert-Moreno A, Swoger J, Russo L, Kawasaki K, Richtsmeier J, Sharpe J. (2018). **Quantification of gene expression patterns to reveal the origins of abnormal morphogenesis.** Elife 7 doi: 10.7554/eLife.36405"
12. "Mayer J, Robert-Moreno A, Sharpe J, Swoger J. (2018). **Attenuation artifacts in light sheet fluorescence microscopy corrected by OPTiSPIM**. Light Sci Appl 7 doi: 10.1038/s41377-018-0068-z".
13. "Kamm RD, Bashir R, Arora N, Dar RD, Gillette MU, Griffith LG, Kemp ML, Kinlaw K, Levin M, Martin AC, McDevitt TC, Nerem RM, Powers MJ, Saif TA, Sharpe J, Takayama S, Takeuchi S, Weiss R, Ye KM, Yevick HG, Zaman MH, Zaman MH. (2018). **Perspective: The promise of multi-cellular engineered living systems.** APL BIOENG 2(4) doi: 10.1063/1.5038337"
14. Ozga AJ, Moalli F, Abe J, Swoger J, Sharpe J, Zehn D, Kreutzfeldt M, Merkler D, Ripoll J, Stein J. (2016) pMHC affinity controls duration of CD8+ T cell-DC interactions and imprints timing of effector differentiation versus expansion. ***The Journal of experimental medicine***. 213 (12).
15. Onimaru K, Marcon L, Musy M, Tanaka M, & Sharpe J (2016) The fin-to-limb transition as the re-organization of a Turing pattern. ***Nature communications*** 7:11582.
16. Marcon L, Diego X, Sharpe J, & Muller P (2016) High-throughput mathematical analysis identifies Turing networks for patterning with equally diffusing signals. ***eLife*** 5:e14022
17. Abe J, Ozga AJ, Swoger J, Sharpe J, Ripoll J, Stein JV. (2016) Light sheet fluorescence microscopy for in situ cell interaction analysis in mouse lymph nodes. ***Journal of Immunological Methods***. 431: 1-10
18. Martínez-Abadías N, Mateu R, Niksic M, Russo L, Sharpe J. (2016) Geometric Morphometrics on Gene Expression Patterns Within Phenotypes: A Case Example on Limb Development. ***Systematic Biology*** 65: 194-211, IF: 11,532
19. Cotterell J, Robert-Moreno A, Sharpe J. (2015) A Local, Self-Organizing Reaction-Diffusion Model Can Explain Somite Patterning in Embryos. ***Cell Systems*** 1 (4), 257-269
20. Onimaru K, Shigehiro K, Takagi W, Hyodo S, Sharpe J*, Tanaka M. (2015) A shift in anterior-posterior positional information underlies the fin-to-limb evolution. ***eLife***. 4:e07048
21. Uzkudun M., Marcon L., Sharpe J. (2015) Data-driven modelling of a gene regulatory network for cell fate decisions in the growing limb bud. ***Molecular Systems Biology*** 11:815-815.
22. Saias L, Swoger J, D'Angelo A, Hayes P, Colombelli J, Sharpe J, Salbreux G, Solon J. (2015) Decrease in Cell Volume Generates Contractile Forces Driving Dorsal Closure. ***Developmental Cell***. 33:611-621.
23. Agusti A (….) Sharpe J. (…) Jacob I. Sznajder. (2015) Personalized Respiratory Medicine: Exploring the Horizon. Addressing the Issues Summary of a BRN-AJRCCM Workshop Held in Barcelona on June 12, 2014. ***American Journal of Respiratory and Critical Care Medicine***. 191:391-401.
24. Schulze, A, Gomez-Marin, A., Rajendran, Vani G., Lott G, Musy M, Ahammad P, Deogade A, Sharpe J, Riedl J, Jarriault D, Trautman ET, Werner C, Venkadesan M, Druckmann S, Jayaraman V, Louis M. (2015). Dynamical feature extraction at the sensory periphery guides chemotaxis. ***eLife*** 4:e06694

25. Jimenez, A., Munteanu, A., Sharpe, J. (2015) Dynamics of gene circuits shapes evolvability. ***PNAS*** 112(7):2103-2108.

26. Green JBA, Sharpe J. (2015). Positional information and reaction-diffusion: two big ideas in developmental biology combine. ***Development*** 142(7) 1203-2011.

27. Schaerli Y, Munteanu A, Gili M, Cotterell J, Sharpe J*, Isalan M. (2014). A unified design space of synthetic stripe-forming networks. ***Nature Communications*** 5:4905.

28. Handschuh K et al. (2014) ESCRT-II/Vps25 Constrains Digit Number by Endosome-Mediated Selective Modulation of FGF-SHH Signaling. ***Cell Reports*** 9: 674–687

29. Munteanu A, Cotterell J, Solé RV, Sharpe J. (2014). Design principles of stripe-forming motifs: the role of positive feedback. ***Scientific Reports*** 4:5003.

30. Sharpe J. (2014) Developmental biology: Cells unite by trapping a signal. ***Nature*** 515(7525) 41-42.

31. Raspopovic J, Marcon L, Russo L, Sharpe J. (2014). Digit patterning is controlled by a Bmp-Sox9-Wnt Turing network modulated by morphogen gradients. ***Science*** 345(6196) 566-570.

32. Nowlan NC, Chandaria V, Sharpe J. (2014) Immobilized Chicks as a Model System for Early-Onset Developmental Dysplasia of the Hip. ***Journal of Orthopaedic Research*** 32 (6) 777-785.

33. Nowlan NC, Sharpe J. (2014) Joint shape morphogenesis precedes cavitation of the developing hip joint. ***Journal of Anatomy*** 224 (4): 482-489

34. Jaeger J, Sharpe J. (2014) On the concept of mechanism in development. Chapter in book: *Towards a theory of development, 56-78*

35. Mayer J, Robert-Moreno A, Danuser R, Stein JV, Sharpe J, Swoger J. (2014) OPTiSPIM: integrating optical projection tomography in light sheet microscopy extends specimen characterization to nonfluorescent contrasts. ***Optics letters*** 39 (4), 1053-1056

36. Allena R., Aubry D., Sharpe J. (2013). On the Mechanical Interplay Between Intra- and Inter-Synchronization During Collective Cell Migration: A Numerical Investigation***. Bulletin of Mathematical Biology*** 75 (12): 2575-2599.

37. Storer M, Mas A, Robert-Moreno A, Pecoraro M, Ortells M, Di Giacomo V, Yosef R, Pilpel N, Krizhanovsky V, Sharpe J, Keyes William M. (2013). Senescence Is a Developmental Mechanism that Contributes to Embryonic Growth and Patterning. ***Cell*** 155 (5): 1119-1130.

38. Pinto-Teixeira F., Muzzopappa M., Swoger J., Mineo A., Sharpe J., Lopez-Schier H. (2013). Intravital imaging of hair-cell development and regeneration in the zebrafish. ***Frontiers in Neuroanatomy*** 7.

39. Coelho FM, Natale D, Soriano SF, Hons M, Swoger J, Mayer J, Danuser R, Scandella E, Pieczyk M, Zerwes H-G, Junt T, Sailer AW, Ludewig B, Sharpe J, Thilo Figge M, Stein JV. (2013) Naive B-cell trafficking is shaped by local chemokine availability and LFA-1–independent stromal interactions. ***Blood*** 121 (20), 4101-4109

40. Cotterell J & Sharpe J. (2013) Mechanistic explanations for restricted evolutionary paths that emerge from gene regulatory networks. ***PloS One*** 8 (4), e61178

41. Degenkolbe E., Konig J., Zimmer J., Walther M., Reissner C., Nickel J., Ploger F., Raspopovic J., Sharpe J., Dathe K., Hecht J.T., Mundlos S., Doelken S.C., Seemann P. (2013). A GDF5 Point Mutation Strikes Twice - Causing BDA1 and SYNS2. ***PLoS Genetics*** 9 (10): e1003846.

42. Eriksson AU, Svensson C, Hörnblad A, Cheddad A, Kostromina E, Eriksson M, Norlin N, Pileggi A, Sharpe J, Georgsson F, Alanentalo T, Ahlgren U. (2013). Near infrared optical projection tomography for assessments of beta-cell mass distribution in diabetes research. ***Journal of Visualized Experiments*** (71): e50238.

43. Sanders PGT, Cotterell J, Sharpe J, Isalan M. (2013) Transfecting RNA quadruplexes results in few transcriptome perturbations. ***RNA biology*** 10 (2), 205-210

44. Sheth R, Marcon L, Bastida MF, Junco M, Quintana L, Dahn R, Kmita M, Sharpe J*, Ros MA (2012) Hox genes regulate digit patterning by controlling the wavelength of a turing-type mechanism. ***Science*** 338 (6113): 1476-1480.

45. J Mayer, J Swoger, AJ Ozga, JV Stein, J Sharpe. (2012) Quantitative measurements in 3-dimensional datasets of mouse lymph nodes resolve organ-wide functional dependencies. ***Computational and Mathematical Methods in Medicine***. ID 128431

46. Marcon L, Sharpe J. (2012). Turing patterns in development: What about the horse part? ***Current Opinion in Genetics & Development*** 22: 578-584

47. Briscoe J., Sharpe J. (2012). Genetics of system biology. ***Current Opinion in Genetics & Development***. 22: 523-526

48. OE Olarte, J Licea-Rodriguez, JA Palero, EJ Gualda, D Artigas, J Mayer, et al. (2012) Image formation by linear and nonlinear digital scanned light-sheet fluorescence microscopy with Gaussian and Bessel beam profiles. ***Biomedical optics express*** 3 (7), 1492-1505

49. J Stein, F Coelho, S Soriano, D Natale, J Swoger, J Mayer, Q Chai et al. (2012) Analyzing the in vivo contribution of G-protein coupled receptors for naive B cell trafficking in lymph nodes. ***The Journal of Immunology*** 188, 44.23-44.23

50. A Cheddad, C Svensson, J Sharpe, F Georgsson, U Ahlgren. (2012) Image processing assisted algorithms for optical projection tomography. ***IEEE transactions on medical imaging*** 31 (1), 1-15

51. Sharpe J. (2011). Two ways to use imaging: focusing directly on mechanism, or indirectly via behaviour? ***Current Opinion in Genetics & Development***, 21(5), 523-529.

52. Laura Quintana & **James Sharpe**. (2011) Optical projection tomography of vertebrate embryo development. ***Cold Spring Harbor Protocols*** doi: 10.1101/pdb.top116

53. Domínguez-Frutos E, López-Hernández I, Vendrell V, Neves J, Gallozzi M, Gutsche K, Quintana L, Sharpe J, Knoepfler P, Eisenman R, Trumpp A, Giráldez F, Schimmang T. (2011) N-myc Controls Proliferation, Morphogenesis, and Patterning of the Inner Ear. ***Journal of Neuroscience***. 31(19):7178-7189

54. Jimenez-Guri E, Udina F, Colas JF, Sharpe J, Padrón-Barthe L, Torres M, Pujades C. (2011) Clonal analysis in mice underlines the importance of rhombomeric boundaries in cell movement/ restriction during hindbrain segmentation. ***PLoS One*** 5(4):e10112

55. Capellini TD, Handschuh K, Quintana L, Ferretti E, Di Giacomo G, Fantini S, Vaccari G, Clarke SL Wenger AM, Bejerano G, Sharpe J, Zappavigna V, Selleri L. (2011) Control of pelvic girdle development by genes of the Pbx family and Emx2. ***Developmental Dynamics*** 240 1173-1189

56. Hopyan S, Sharpe J, Yang Y. (2011) Budding behaviors: Growth of the limb as a model of morphogenesis. ***Developmental Dynamics*** 240: 1054-1062.

57. Sharpe J, Wong R, Yuste R. Imaging in Developmental Biology: A Laboratory Manual. Cold Spring Harbor Laboratory Press (2011).

58. Boehm B, Rautschka M, Quintana L, Raspopovic J, Jan Z, Sharpe J. (2011) A landmark-free morphometric staging system for the mouse limb bud. ***Development*** 138(6):1227-34.

59. Marcon L, Arqués CG, Torres MS, Sharpe J. (2011) A computational clonal analysis of the developing mouse limb bud. ***PLoS Computational Biology*** 7(2):e1001071

60. Cotterell J & Sharpe J. (2010) An atlas of gene regulatory networks reveals multiple three-gene mechanisms for interpreting morphogen gradients. ***Molecular Systems Biology*** 6:425

61. Swoger J, Muzzopappa M, Lopez-Schier H, Sharpe J. (2010) 4D retrospective lineage tracing using SPIM for zebrafish organogenesis studies. ***Journal of Biophotonics*** 4: 122–134

62. Nowlan NC, Sharpe J, Roddy KA, Prendergast PJ, Murphy P. (2010) Mechanobiology of embryonic skeletal development: Insights from animal models. ***Birth Defects Res C Embryo Today*** 90(3):203-213

63. Capellini TD, Vaccari G, Ferretti E, Fantini S, He M, Pellegrini M, Quintana L, Di Giacomo G, Sharpe J, Selleri L, Zappavigna V. (2010) Scapula development is governed by genetic interactions of Pbx1 with its family members and with Emx2 via their cooperative control of Alx1. ***Development*** 137(15):2559-69.

64. Boehm B, Westerberg H, Lesnicar-Pucko G, Raja S, Rautschka M, Cotterell J, Swoger J, Sharpe J. (2010) The role of spatially-controlled cell proliferation in limb bud morphogenesis. ***PLoS Biology***. 8(7): e1000420

65. T Alanentalo, A Hörnblad, S Mayans, AK Nilsson, J Sharpe, Å Larefalk et al. (2010) Quantification and three-dimensional imaging of the insulitis-induced destruction of β-cells in murine type 1 diabetes. ***Diabetes*** 59 (7), 1756-1764

66. Jimenez-Guri E, Udina F, Colas JF, Sharpe J, Padron L, Torres M, Pujades C. (2010) Clonal analysis in mice underlines the importance of rhombomeric boundaries in cell movement restriction during hindbrain segmentation. ***PLoS ONE*** 5(4): e10112

67. Colas JF & Sharpe J. (2009) Live OPT ***Organogenesis*** 5(4):129-42.

68. Lemos MC, Harding B, Reed AA, Jeyabalan J, Walls GV, Bowl MR, Sharpe J, Wedden S, Moss J, Ross A, Davidson S, Thakker RV. (2009) Genetic background influences embryonic lethality and the occurrence of neural tube defects in Men1 null mice: relevance to genetic modifiers. ***Journal of Endocrinology***. 203(1):133-42

69. Vendrell V, Summerhurst K, Sharpe J, Davidson D, Murphy P. (2009) Gene expression analysis of canonical Wnt pathway transcriptional regulators during early morphogenesis of the facial region in the mouse embryo. ***Gene Expression Patterns*** 9(5):296-305

70. Hajihosseini MK, Duarte R, Pegrum J, Donjacour A, Lana-Elola E, Rice DP, Sharpe J, Dickson C. (2009) Evidence that Fgf10 contributes to the skeletal and visceral defects of an Apert syndrome mouse model. ***Developmental Dynamics*** 238(2):376-85

71. A Darrell, J Swoger, L Quintana, J Sharpe, K Marias, M Brady, J Ripoll. (2008) Improved fluorescence optical projection tomography reconstruction. ***SPIE Newsroom*** 10 (2) 1200810.1329

72. McGinty J, Tahir KB, Laine R, Talbot CB, Dunsby C, Neil MAA, Quintana L, Swoger J, Sharpe J, French PMW. (2008) Fluorescence lifetime optical projection tomography. ***Journal of Biophotonics*** 1(5):390-4

73. Alanentalo T, Lorén CE, Larefalk A, Sharpe J, Holmberg D, Ahlgren U. (2008) High-resolution three-dimensional imaging of islet-infiltrate interactions based on optical projection tomography assessments/ of the intact adult mouse pancreas. ***Journal of Biomedical Optics*** 13(5):054070

74. Boot M, Westerberg CH, Sanz-Ezquerro J, Cotterell J, Schweitzer R, Torres M, Sharpe J. (2008) *In vitro* whole-organ imaging: 4D quantification of growing mouse limb buds. ***Nature Methods.*** 5:609-612.

75. Summerhurst K, Stark M, Sharpe J, Davidson D, Murphy P. (2008) 3D representation of Wnt and Frizzled gene expression patterns in the mouse embryo at embryonic day 11.5 (Ts19). ***Gene Expression Patterns*** 8:331-48

76. Hajihosseini M, De Langhe S, Lana-Elola E, Morrison H, Sparshott N, Kelly R, Sharpe J, Rice D, Bellusci S. (2008) Localization and fate of Fgf10-expressing cells in the adult mouse brain implicate Fgf10 in control of neurogenesis. ***Molecular and Cellular Neuroscience*** 37:857-68

77. Sharpe J. 3D Imaging of embryos and mouse organs by Optical Projection Tomogrpahy. Chapter 12.1 from ***Textbook of in-vivo imaging in vertebrates*** (2007) Wiley

78. Arques CG, Doohan R, Sharpe J, Torres M. (2007) Cell tracing reveals a dorsoventral lineage restriction plane in the mouse limb bud mesenchyme. ***Development*** 134:3173-3722

79. McGurk L, Morrison H, Keegan LP, Sharpe J, O'Connell MA. (2007) Three-Dimensional Imaging of Drosophila melanogaster. ***PLoS ONE*** 2(9):e834

80. Bryson-Richardson RJ, Berger S, Schilling TF, Hall TE, Cole NJ, Gibson AJ, Sharpe J, Currie PD. (2007) FishNet: an online database of zebrafish anatomy. ***BMC Biology*** 5(1):34

81. Walls JR, Sled JG, Sharpe J, Henkelman RM. (2007) Resolution improvement in emission optical projection tomography. ***Physics in Medicine and Biology*** 52(10):2775-2790

82. Alanentalo T, Asayesh A, Morrison H, Loren CE, Holmberg D, Sharpe J, Ahlgren U. (2007) Tomographic molecular imaging and 3D quantification within adult mouse organs. ***Nature Methods*** 4(1):31-3

83. Lee K, Avondo J, Morrison H, Blot L, Stark M, **Sharpe J**, Bangham A, Coen E. (2006) Visualizing plant development and gene expression in three dimensions using optical projection tomography. ***Plant Cell*** 18(9):2145-56

84. Asayesh A, Sharpe J, Watson RP, Hecksher-Sorensen J, Hastie ND, Hill RE, Ahlgren U. (2006) Spleen versus pancreas: strict control of organ interrelationship revealed by analyses of Bapx1-/- mice. ***Genes and Development*** 20(16):2208-13

85. Sarma S, Kerwin J, Puelles L, Scott M, Strachan T, Feng G, **Sharpe J**, Davidson D, Baldock R, Lindsay S. (2005) 3D modelling, gene expression mapping and post-mapping image analysis in the developing human brain. ***Brain Research Bulletin*** 66:449-453

86. Walls JR, Sled J, Sharpe J, Henkelman M. (2005) Correction of artefacts in optical projection tomography. ***Physics in Medicine and Biology*** 50:1-21.

87. Sharpe J. (2005) Optical Projection Tomography: Imaging 3D Organ Shapes and Gene Expression Patterns in Whole Vertebrate Embryos. Chapter in ***Imaging in Neuroscience and Development*** (Ed. Yuste & Konnerth, CHSL Press)

88. Janet Kerwin, Mark Scott, **James Sharpe**, Luis Puelles, Steve Robson, Margaret Martínez-de-la-Torre, Jose Luis Feran, Guangjie Feng, Richard Baldock, Tom Strachan, Duncan Davidson, Susan Lindsay. (2004) 3-dimensional modelling of early human brain development using optical projection tomography. ***BMC Neurobiology*** 5:27

89. Sharpe J. Optical Projection Tomography. ***Annual Review of Biomedical Engineering*** 6:209-228

90. Wilkie A, Jorden S, Sharpe J, Price D, Jackson I. (2004) Tangential widespread dispersion and extensive cell death during early neurogenesis in the mouse neocortex. ***Developmental Biology*** 267:109-118

91. Sharpe J. Optical projection tomography as a new tool for studying embryo anatomy. ***Journal Of Anatomy*** 202:175-181 (2003)

92. Sharpe J, Ahlgren U, Perry P, Hill B, Ross A, Hecksher-Sorensen J, Baldock R, Davidson D. (2002) Optical Projection Tomography: A new approach for 3-D microscopy and gene expression studies. ***Science*** 296:541-545

93. Hecksher-Sorensen J, Sharpe J. (2001) 3D confocal reconstruction of gene expression in mouse. ***Mechanisms of Development*** 100:59-63

94. Sharpe J, Lettice L, Hecksher-Sorensen J, Fox M, Hill R, Krumlauf R. (1999) Identification of Sonic hedgehog as a candidate gene responsible for the polydactylous mouse mutant Sasquatch. ***Current Biology*** 9:97-100

95. Sharpe J, Nonchev S, Gould A, Whiting J, Krumlauf R. (1998) Selectivity, sharing and competitive interactions in the regulation of Hoxb genes. ***EMBO Journal*** 17(6):1788-1798

96. Itasaki N, Sharpe J, Morrison A, Krumlauf R. (1996) Reprogramming Hox expression in the vertebrate hindlimb: Influence of paraxial mesoderm and rhombomere transposition. ***Neuron*** 16:487-500

97. Sharpe J and Day A. (1993) Structure, evolution and expression of the mitochondrial ADP/ATP translocator gene from *Chlamydomonas reinhardtii*". ***Molecular Genetics and Genomics*** 237:134-144