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### **Personal statement**

Fish schools, ant colonies and bird flocks are complex systems that coordinate their collective behaviors to control the emergence and progression of patterns and functions. For example, fishes form schools with specific shapes that allow them to swim faster and protect them from predators better than individual animals are able to. This broad range of decentralized, adaptive and emergent behaviors based on local interactions and dynamic feedbacks is called self-organization. We explore how self-organization complements more traditional hierarchical intrinsic (e.g., HOX genes collinearity) and extrinsic (e.g., positional information) processes to shape the mammalian organism.

The *blastocyst* is the early mammalian organism before it implants in the uterus. It is a powerful model for self-organization because it is autonomous, adaptive, and small enough to be studied in great detail. Our lab created the first model of the blastocyst, termed the *blastoid*, which is formed by the spontaneous organization of stem cells in a dish. Blastoids contain all three cell types that further develop into the complete organism (embryonic and extra-embryonic tissues), and implant when transferred *in utero*. Contrary to blastocysts, blastoids are versatile in that they facilitate the systematic modulation and analysis of the impact of cell numbers, states and communication mechanisms on development. Furthermore, blastoids are readily generated in large numbers, making them suitable for high-throughput genetic and drug screens.

We observe how self-organization contributes to multicellular patterning and coordinated cellular decision making in blastocysts and blastoids.

## **Positions**

2019 – Present.

Principal investigator at the Institute of Molecular Biotechnology, Austrian Academy of Science. Austria.

*Subject:* Synthetic mammalian development.

2013 – 2019.

Principal investigator at the MERLN Institute, Maastricht University, The Netherlands.

Guest at the Hubrecht Institute for developmental biology and stem cell research. The Netherlands.

*Subject:* Synthetic mammalian development.

2011 – 2013.

Researcher at the MIRA Institute, Twente University. The Netherlands.

Guest at the Hubrecht Institute for developmental and stem cell research. The Netherlands.

*Subject:* Synthetic mammalian development. Personal research line. Supervisor of two PhD students.

2006 – 2010.

PhD at the MIRA Institute, University of Twente. The Netherlands.

*Thesis:* Self-organized vascular networks for tissue regeneration.

2002 – 2004.

Researcher at Medtronic Inc. U.S.A.

Heart Valve Research Division, California.

Material and Bioscience Center, Minnesota.

*Subject:* Polymers for cardiovascular medicine.

## **Education**

2006 – 2010. University of Twente. The Netherlands.

PhD in vascular biology, tissue engineering.

1998 – 2003. Université de Technologie de Compiègne. France.

Engineer and MSc in biology and physics.

## **Publications**

**Main papers.** I act as a corresponding author (\*) on these manuscripts.

Protocol for Human Blastoids Modeling Blastocyst Development and Implantation. Kagawa H, Javali A, Heidari Khoei H, Sommer TM, Sestini G, Novatchkova M, Scholte Op Reimer Y, **Rivron N\***. J Vis Exp. 2022 Aug 10;(186). doi: 10.3791/63388. PMID: 36036618

A pendulum of induction between the epiblast and extra-embryonic endoderm supports post-implantation progression. Vrij EJ\*, Scholte Op Reimer YS, Fuentes LR, Guerreiro IM, Holzmann V, Aldeguer JF, Sestini G, Koo BK, Kind J, van Blitterswijk CA, **Rivron NC\***. Development. 2022 Oct 15;149(20):dev192310. doi: 10.1242/dev.192310. Epub 2022 Aug 22. PMID: 35993866

Epiblast inducers capture mouse trophectoderm stem cells in vitro and pattern blastoids for implantation in utero. Seong J, Frias-Aldeguer J, Holzmann V, Kagawa H, Sestini G, Heidari Khoei H, Scholte Op Reimer Y, Kip M, Pradhan SJ, Verwegen L, Vivié J, Li L, Alemany A, Korving J, Darmis F, van Oudenaarden A, Ten Berge D, Geijssen N, **Rivron NC\***. Cell Stem Cell. 2022 Jul 7;29(7):1102-1118.e8. doi: 10.1016/j.stem.2022.06.002. PMID: 35803228

20 years of Developmental Cell: Looking forward. Hiiragi T, Gladfelter AS, Miguel-Aliaga I, Coller HA, Lau OS, McBride HM, Aoki K, Linkermann A, Santaguida S, Wasteneys G, **Rivron NC**, Shahbazi MN, Ebisuya M, Lancaster MA. Dev Cell. 2021 Dec 6;56(23):3185-3191. doi: 10.1016/j.devcel.2021.11.017. PMID: 34875224

Human blastoids model blastocyst development and implantation. Kagawa H, Javali A, Khoei HH, Sommer TM, Sestini G, Novatchkova M, Scholte Op Reimer Y, Castel G, Bruneau A, Maenhoudt N, Lammers J, Loubersac S, Freour T, Vankelecom H, David L, **Rivron N\***. Nature. 2021 Dec 2. doi: 10.1038/s41586-021-04267-8. PMID: 34856602

It takes a village to form embryo models. **Rivron NC\***, Fu J\*. Stem Cell Reports. 2021 May 11;16(5):1011-1013. doi: 10.1016/j.stemcr.2021.04.014. PMID: 33979590.

*SnapShot*: Embryo models. **Rivron NC\***, Fu J\*. *Stem Cell Reports*. 2021 May 11;16(5):1142-1142.e1. doi: 10.1016/j.stemcr.2021.04.012. PMID: 33979599.

How will our understanding of human development evolve over the next 10 years? Brivanlou AH, **Rivron N**, Gleicher N. *Nat Commun*. 2021 Jul 29;12(1):4614. doi: 10.1038/s41467-021-24794-2. PMID: 34326327

Human embryo research, stem cell-derived embryo models and in vitro gametogenesis: Considerations leading to the revised ISSCR guidelines. Clark AT, Brivanlou A, Fu J, Kato K, Mathews D, Niakan KK, **Rivron N**, Saitou M, Surani A, Tang F, Rossant J. *Stem Cell Reports*. 2021 Jun 8;16(6):1416-1424. doi: 10.1016/j.stemcr.2021.05.008. Epub 2021 May 27. PMID: 34048690.

ISSCR Guidelines for Stem Cell Research and Clinical Translation: The 2021 update. Lovell-Badge R, Anthony E, Barker RA, Bubela T, Brivanlou AH, Carpenter M, Charo RA, Clark A, Clayton E, Cong Y, Daley GQ, Fu J, Fujita M, Greenfield A, Goldman SA, Hill L, Hyun I, Isasi R, Kahn J, Kato K, Kim JS, Kimmelman J, Knoblich JA, Mathews D, Montserrat N, Mosher J, Munsie M, Nakauchi H, Naldini L, Naughton G, Niakan K, Ogbogu U, Pedersen R, **Rivron N**, Rooke H, Rossant J, Round J, Saitou M, Sipp D, Steffann J, Sugarman J, Surani A, Takahashi J, Tang F, Turner L, Zettler PJ, Zhai X. *Stem Cell Reports*. 2021 Jun 8;16(6):1398-1408. doi: 10.1016/j.stemcr.2021.05.012. Epub 2021 May 27. PMID: 34048692 Review.

Frias-Aldeguer J, Kip M, Vivié J, Li L, Alemany A, Korving J, Darmis F, van Oudenaarden A, Geijsen N, **Rivron NC\***. Embryonic signals perpetuate polar-like trophoblast stem cells and pattern the blastocyst axis. *BioRxiv* 510362; doi: <https://doi.org/10.1101/510362>

Vrij EJ\*, Scholte op Reimer YS, Frias Aldeguer J, Misteli Guerreiro I, Kind J, Koo BK, van Blitterswijk CA, **Rivron NC\***. Chemically-defined induction of a primitive endoderm and epiblast-like niche supports post-implantation progression from blastoids. *BioRxiv* 510396; doi: <https://doi.org/10.1101/510396>.

**Rivron NC**. Developing a Niche in Stem Cell Biology. Part of a “leading-edge voices”. *Cell* 2019.

**Rivron NC\***, Pera MF\*, Rossant J, Martinez-Arias A, Zernicka-Goetz M, Fu J, van den Brink SC, Bredenoord AL, Dondorp W, De Wert G, Hyun I, Munsie M, Isasi R. Debate ethics of embryo models

from stem cells. *Nature*. 2018 Dec;564(7735):183-185. doi: 10.1038/d41586-018-07663-9. PMID: 30542177

Martin Pera and I led this consortium of stem cell biologists, ethicists, philosophers and lawyers to discuss the societal and ethical implications of stem cell-based embryo models.

Organs by design: can bioprinting meet self-organization? Martin I, Malda J, **Rivron NC**.

*Curr Opin Organ Transplantation* 2019. Oct;24(5):562-567. doi: 10.1097/MOT.0000000000000679.

PMID: 31348016 Review.

**Rivron NC\***, Vrij EJ, Frias-Aldeguer J, Boisset JC, Korving J, Truckenmuller RK, van Oudenaarden A, van Blitterswijk CA<sup>^</sup>, Geijsen N<sup>^</sup>. Blastocyst-like structures generated solely from stem cells. *Nature*. 2018 May;557(7703):106-111. doi: 10.1038/s41586-018-0051-0. Epub 2018 May 2. PMID: 29720634

<sup>^</sup> Equal contribution.

Commented on the BBC, CNN, Fortune and other media.

I conceived, directed and performed the project, while in collaboration with the stem cell biologist Niels Geijsen and with the quantitative/theoretical biologist Alexander van Oudenaarden (Hubrecht Institute).

Kicheva A\*, **Rivron NC\***. Creating to understand - developmental biology meets engineering in Paris. *Development*. 2017 Mar 1;144(5):733-736. doi: 10.1242/dev.144915. PMID: 28246208

Vrij EJ, Rouwkema J, LaPointe VLS, van Blitterswijk CA, Truckenmüller R, **Rivron NC\***. Directed Assembly and Development of Material-Free Tissues with Complex Architectures. *Adv Mater*. 2016 Jun;28(21):4032-9. doi: 10.1002/adma.201505723. Epub 2016 Mar 22. PMID: 27000493

Vrij E, Espinoza S, Heilig M, Kolew A, Schneider AM, Truckenmuller RK, van Blitterswijk CA, **Rivron NC\***. 3D high throughput screening and profiling of embryoid bodies in thermoformed microwell plates. *Lab Chip*. 2016 Feb 21;16(4):734-42. doi: 10.1039/c5lc01499a. Epub 2016 Jan 18. PMID: 26775648

**Rivron NC\***, Vrij EJ, Rouwkema J, Le Gac S, van den Berg A, Truckenmüller RK, van Blitterswijk CA. Tissue deformation spatially modulates VEGF signaling and angiogenesis. *Proc Natl Acad Sci U S A*. 2012 May 1;109(18):6886-91. doi: 10.1073/pnas.1201626109. Epub 2012 Apr 17. PMID: 22511716

**Rivron NC\***, Raiss CC, Liu J, Nandakumar A, Sticht C, Gretz N, Truckenmüller R, Rouwkema J, van Blitterswijk CA. Sonic Hedgehog-activated engineered blood vessels enhance bone tissue formation. *Proc Natl Acad Sci U S A*. 2012 Mar 20;109(12):4413-8. doi: 10.1073/pnas.1117627109. Epub 2012 Mar 2. PMID: 22388744

**Rivron NC\***, Rouwkema J, Truckenmüller R, Karperien M, De Boer J, Van Blitterswijk CA. Tissue assembly and organization: developmental mechanisms in microfabricated tissues. *Biomaterials*. 2009 Oct;30(28):4851-8. doi: 10.1016/j.biomaterials.2009.06.037. Epub 2009 Jul 9. PMID: 19592088

**Rivron NC\***, Liu J J, Rouwkema J, de Boer J, van Blitterswijk CA. Engineering vascularised tissues in vitro. *Eur Cell Mater*. 2008 Feb 21;15:27-40. doi: 10.22203/ecm.v015a03. PMID: 18288631 Review.

### **Papers from collaborations led by colleagues**

Modeling human extraembryonic mesoderm cells using naive pluripotent stem cells. Pham TXA, Panda A, Kagawa H, To SK, Ertekin C, Georgolopoulos G, van Knippenberg SSFA, Allsop RN, Bruneau A, Chui JS, Vanheer L, Janiszewski A, Chappell J, Oberhuemer M, Tchinda RS, Talon I, Khodeer S, Rossant J, Lluís F, David L, **Rivron N**, Balaton BP, Pasque V. *Cell Stem Cell*. 2022 Sep 1;29(9):1346-1365.e10. doi: 10.1016/j.stem.2022.08.001. PMID: 36055191

Single-cell multi-omics of human preimplantation embryos demonstrates susceptibility to glucocorticoids. Zhao C, Biondic S, Vandal K, Bjorklund AK, Hagemann-Jensen M, Sommer TM, Canizo J, Clark S, Raymond P, Zenklusen D, **Rivron N**, Reik W, Petropoulos S. *Genome Res*. 2022 Aug 10;gr.276665.122. doi: 10.1101/gr.276665.122. Online ahead of print. PMID: 35948369

Integrated multi-omics reveal polycomb repressive complex 2 restricts human trophoblast induction. Zijlmans DW, Talon I, Verhelst S, Bendall A, Van Nerum K, Javali A, Malcolm AA, van Knippenberg SSFA, Biggins L, To SK, Janiszewski A, Admiraal D, Knops R, Corthout N, Balaton BP, Georgolopoulos G, Panda A, Bhanu NV, Collier AJ, Fabian C, Allsop RN, Chappell J, Pham TXA, Oberhuemer M, Ertekin C, Vanheer L, Athanasouli P, Lluís F, Deforce D, Jansen JH, Garcia BA, Vermeulen M, **Rivron N**, Dhaenens M, Marks H, Rugg-Gunn PJ, Pasque V. *Nature Cell Biology*. 2022 Jun;24(6):858-871. doi: 10.1038/s41556-022-00932-w. PMID: 35697783

A probabilistic framework for cellular lineage reconstruction using integrated single-cell 5-hydroxymethylcytosine and genomic DNA sequencing. Wangsanuwat C, Chialastri A, Aldeguez JF, **Rivron NC**, Dey SS. *Cell Rep Methods*. 2021 Aug 23;1(4):100060. doi: 10.1016/j.crmeth.2021.100060. Epub 2021 Jul 30. PMID: 34590075

Neagu A, van Genderen E, Escudero I, Verwegen L, Kurek D, Lehmann J, Stel J, Dirks RAM, van Mierlo G, Maas A, Eleveld C, Ge Y, den Dekker AT, Brouwer RWW, van IJcken WFJ, Modic M, Drukker M, Jansen JH, **Rivron NC**, Baart EB, Marks H, Ten Berge D. In vitro capture and characterization of embryonic rosette-stage pluripotency between naive and primed states. *Nature Cell Biology*. 2020.

Induction of Human Trophoblast Stem Cells from Somatic Cells and Pluripotent Stem Cells. Castel G, Meistermann D, Bretin B, Firmin J, Blin J, Loubersac S, Bruneau A, Chevolleau S, Kilens S, Chariou C, Gaignerie A, Francheteau Q, Kagawa H, Charpentier E, Flippe L, François-Campion V, Haider S, Dietrich B, Knöfler M, Arima T, Bourdon J, **Rivron N**, Masson D, Fournier T, Okae H, Fréour T, David L. *Cell Rep*. 2020 Nov 24;33(8):108419. doi: 10.1016/j.celrep.2020.108419. PMID: 33238118

Toward Guidelines for Research on Human Embryo Models Formed from Stem Cells. Hyun I, Munsie M, Pera MF, **Rivron NC**, Rossant J. *Stem Cell Reports*. 2020 Feb 11;14(2):169-174. doi: 10.1016/j.stemcr.2019.12.008. Epub 2020 Jan 16. PMID: 31951813

Basak O, Krieger TG, Muraro MJ, Wiebrands K, Stange DE, Frias-Aldeguez J, **Rivron NC**, van de Wetering M, van Es JH, van Oudenaarden A, Simons BD, Clevers H. Troy+ brain stem cells cycle through quiescence and regulate their number by sensing niche occupancy. *Proc Natl Acad Sci U S A*. 2018 Jan 23;115(4):E610-E619. doi: 10.1073/pnas.1715911114. Epub 2018 Jan 8. PMID: 29311336

Leferink A, Schipper D, Arts E, Vrij E, **Rivron NC**, Karperien M, Mittmann K, van Blitterswijk C, Moroni L, Truckenmüller R. Engineered micro-objects as scaffolding elements in cellular building blocks for bottom-up tissue engineering approaches. *Adv Mater*. 2014 Apr 23;26(16):2592-9. doi: 10.1002/adma.201304539. Epub 2014 Jan 7. PMID: 24395427

Potier E, **Rivron NC**, Van Blitterswijk CA, Ito K. Micro-aggregates do not influence bone marrow stromal cell chondrogenesis. *J Tissue Eng Regen Med*. 2016 Dec;10(12):1021-1032. doi: 10.1002/term.1887. Epub 2014 Apr 2. PMID: 24700552

Fennema E, **Rivron NC**, Rouwkema J, van Blitterswijk C, de Boer J. Spheroid culture as a tool for creating 3D complex tissues. Trends Biotechnol. 2013 Feb;31(2):108-15. doi: 10.1016/j.tibtech.2012.12.003. Epub 2013 Jan 18. PMID: 23336996 Review.

Truckenmüller R, Giselbrecht S, Escalante-Marun M, Groenendijk M, Papenburg B, **Rivron NC**, Unadkat H, Saile V, Subramaniam V, van den Berg A, van Blitterswijk CA, Wessling M, de Boer J, Stamatialis D. Fabrication of cell container arrays with overlaid surface topographies. Biomed Microdevices. 2012 Feb;14(1):95-107. doi: 10.1007/s10544-011-9588-5. PMID: 22048776

Truckenmüller R, Giselbrecht S, **Rivron NC**, Gottwald E, Saile V, van den Berg A, Wessling M, van Blitterswijk C. Thermoforming of film-based biomedical microdevices. Adv Mater. 2011 Mar 18;23(11):1311-29. doi: 10.1002/adma.201003538. Epub 2011 Jan 31. PMID: 21400590 Review.

Rouwkema J, **Rivron NC**, van Blitterswijk CA. Vascularization in tissue engineering. Trends Biotechnol. 2008 Aug;26(8):434-41. doi: 10.1016/j.tibtech.2008.04.009. Epub 2008 Jun 26. PMID: 18585808 Review.

### **Invited lectures**

- Reproductive organoids, Cambridge University. 2022.
- Berlin Stem Cell Network, UT Berlin. 2022.
- XXI Congress of the Brazilian Society for Cell Biology (SBBC). 2022.
- Frontiers in Biological Sciences, Tsinghua University. 2022.
- Belgian Society for Stem Cell Research annual meeting. 2022.
- BaCell 3D conference. 2022.
- ETZ Department of Molecular Health Sciences. 2022.
- Karolinska Institute - Symposium on ethics of embryo models. 2022.
- Southern California Stem Cell Breaking News Seminar. 2022.
  
- Imperial college London. Stem Cell-Based Modelling of Development and Disease. 2021.
- Society for the Study of Reproduction (SSR) 54th Annual Meeting. 2021.
- Cancer Stem Cells & Developmental Biology (CSnD) Master's program. 2021.



- Annual meeting of the Molecular Biology Society of Japan. 2021.
  - Research School in Stem Cell Biology at Lund University. 2021.
  - Leiden University Regenerative medicine summer course. 2021.
  - Curie Institute. 12th Course on Developmental Biology: from Stem Cells to Morphogenesis. 2021.
  - Vienna Biocenter Summer school lecture. 2021.
  - CeRA Summer Academy. Centrum für Reproduktionsmedizin und Andrologie. Münster. 2021.
  - ISSCR Plenary session on Self-Organization of Developmental Processes. 2021.
  - McGill University's Experimental Surgery & IRR Research Day. 2021.
  - 15th Wisconsin Stem Cell Symposium - The Single Cell Revolution in Stem Cells. 2021.
  - 10th International Meeting of the Stem Cell Network NRW. 2021.
  - Stem Cells @ Lunch - King's College London. 2021.
  - SinCeReSt - Single cell regulation of stem cells. 2021.
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- International Society for Stem Cell Research (ISSCR) and the Brazilian Society for Cell Biology (SBBC): fundamental aspects of stem cell biology. 2020.
  - Vienna Biocenter. Ethics in science. 2020.
  - Kyoto University. Bio-ethics seminar series at ASHBi. 2020.
  - EMBO Organoid conference. 2020.
  - Curie Institute. 11th Course on Developmental Biology: from Stem Cells to Morphogenesis. 2020.
  - Weizmann Institute of Science. TT2020 conference.
  - Max Planck Institute / Muenster University. CiM IMPRS Münster conference. 2020.
  - The International IVF Initiative (i3) conference. 2020.
  - Cambridge University. Seminar Vertebrate Gastrulation Zoom Talks. 2020.
  - Cambridge University. Seminar series on self-organization by Alfonso Martinez-Arias. Online. 2020.
  - ESHRE conference. Online. 2020.
  - German stem cell network. Ask the stem cell expert. Online. 2020.
  - CalTech/USC seminar. Online. 2020.
  - CamBioscience organoid workshop. Online. 2020.
  - Development and Stem Cells meeting of the Vienna community. Vienna, Austria. 2020.
  - National Academies of Sciences, Engineering, and Medicine public workshop 'Examining the State of the Science of Mammalian Embryo Model Systems'. Washington, USA. 2020.
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- AIChE Stem cell engineering meeting. Barcelona, Spain. 2019.

- Centro Andaluz de Biología del Desarrollo. Sevilla. 2019.
  - Organoid conference in Bordeaux. France. 2019.
  - Organoid workshop in Paris. France. 2019.
  - CSHL Stem cell biology. U.S.A. 2019.
  - ISSCR. Focus session on the ethics of human embryo models. U.S.A. 2019. "What do blastoids teach us? From blastocyst development to the window of implantation."
  - SY-Stem conference. Vienna, Austria. 2019.
  - EMBL Synthetic Morphogenesis conference. Heidelberg, Germany. 2019.
  - UCLA. Department of biological chemistry. Kathrin Plath. U.S.A. 2019.
  - RIKEN BDR Control and design of biosystems. Kobe, Japan. 2019.
  - University of Minnesota Developmental Biology Symposium. 2019.
  - DevStem meeting. Nantes University. France. 2019.
  - Queen Mary Research Institute. Edinburgh. Scotland. 2019.
  - Swiss Stem Cell Network. Basel. Switzerland. 2019.
  - Erasmus MC Querido Honours College. Rotterdam, The Netherlands. 2019. Synthetic development: ethical and societal implications.
  - IMBA. Vienna, Austria. 2019. Invited lecture.
  - Erasmus University. Rotterdam, The Netherlands. 2019. Invited lecture.
  - DGRM. Dusseldorf, Germany. 2019. Invited lecture.
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- Scientific council of CRB Anim. Paris, France. 2018.
  - Stem Cell Center of Competence. Basel, Switzerland. 2018.
  - Belgium Society of Reproductive Medicine. Bruxelles. 2018.
  - German Stem Cell Network. Heidelberg, Germany. 2018. Keynote. Synthetic development: ethical and societal implications.
  - CiRA Center for iPSC research and applications. Kyoto, Japan. 2018. Invited lecture.
  - RIKEN Center for Developmental Biology. Kobe, Japan. 2018.
  - EMBL Organoid conference. Heidelberg, Germany. 2018.
  - Cambridge University. Department of Physiology. Cambridge, UK. 2018.
  - Royan Institute for stem cells and embryology. Tehran, Iran. 2018.
  - Tissue Engineering Regenerative Medicine and regenerative medicine. Young Investigator forum. Kyoto, Japan. 2018.
  - Pilani Institute of Technology and Science. Pilani, India. 2018. Online lecture. What can stem cells do?

- Aachen University. Aachen, Germany.
- The stem cell niche conference. Copenhagen, Denmark. 2018.
- Cambridge University. Gurdon Institute. Cambridge, UK. 2018.
- Medical Research Council. London, UK. 2018.
- European Society for Human Reproduction. Workshop on In vitro modelling: from Embryo to gametes. Bilbao, Spain. 2018.
- Dutch society for clinical embryology. Utrecht, The Netherlands. 2018. Invited lecture. The clinical potential of synthetic embryos.
  
- Curie Institute. Paris, France. 2017.
- Stem cell and brain research institute. Lyon, France. 2017.
- Pasteur Institute. Paris, France. 2016. In vitro generation of blastocyst-like structures from stem cells. Engineering the embryo conference.
- NRC Live. Amsterdam, The Netherlands. 2016. Battling the global health problems of contraception and infertility.

### **Conference organization**

- ISSCR - Single-cell biology for embryo models and organoids. Vienna. 2023.
- SY-Stem conference for next generation of stem cell researchers. IMBA, Austria. 2022.
- ISSCR - Digital sessions on Embryo models. 2021.
- Rising Young Scientists Symposium. IMBA, Austria. 2021.
- Integrative Developmental Biology. Leiden, The Netherlands. 2021.

### **Grants and Awards**

- 2021 - ZonMW PSIDER (€ 3.5M). Beyond the blastocyst: modelling human embryology with stem cells.
- 2020 - ERC Consolidator grant. ‘Blastoid. A discovery platform for human embryogenesis.’
- 2019 - HFSP Young Investigator grant. Main applicant, in collaboration with Kyogo Kawaguchi (Riken Institute) and Shantanu Singh (Broad Institute).
- 2018 - Weijerhorst grant (€ 2.5M). Co-applicant (declined).
- 2016 - ERC advanced grant of Clemens van Blitterswijk (major contribution in conception).
- 2015 - LINK regional investment.
- 2014 - KNMF personal grant for microfabrication facility. Karlsruhe Institute of Technology, Germany.
- 2013 - Fellow of the Translational Adult Stem Cell Breakthrough programme. ZonMW, The Netherlands.
- 2012 - Young Scientist Award. World Biomaterial Conference, China.
- 2010 - Start-up package (2 PhD positions). University of Twente.
- 2009 - Conference award. EMBO Conference Series on Morphogenesis and Dynamics of Multicellular Systems, Heidelberg, Germany.
- 2009 - Conference award. 35th North-East BioEngineering conference, Boston, U.S.A.

### **Community and public outreach**

Due to the ethical questions raised by embryo models, it is essential to explain to the scientific community and to the public our scientific/biomedical goals, and the societal/ethical implications of our research.

- 2021. Opinion on the future of blastoids as part of a “Voice” article in *Developmental Cell*.
- 2021. Interview as part of a *Nature* feature. “What’s next for lab-grown human embryos?”
- 2021. Interview as part of the *Stem cell podcast* ISSCR 2021 Day 5.
- 2021. Prospective discussion as part of a *Nature Communication* 10<sup>th</sup> anniversary special edition. “How will our understanding of human development evolve over the next 10 years.”
- 2021. Co-organizer of the ISSCR digital sessions on Embryo models.
- 2021. Guest editor of a special edition of *Stem cell reports* on Embryo models.

- 2019. Opinion about “Developing a Niche in Stem Cell Biology” as part of a Leading Voices in *Cell*.
- 2019. *Nature* Podcast. Embryo-like structure synthesized in a lab could help decipher infertility.
- 2019. The *Stem cell podcast* Episode 118: Synthetic Embryos.
- 2018. *BBC World News*. Live interview. Synthetic embryos made from stem cells.
- 2018. *BBC News*. Scientists build synthetic embryos.
- 2018. *CNN*. Artificial embryos created using only stem cells.
- 2018. *Fortune*. Scientists Have Created Synthetic Embryos. Here's What That Could Mean for Humans.

### **Patents**

- Generation of blastocyst- like structures by aggregation and culture of cells. EP21151455. Maintained by IMBA.
- Blastoid, cell line-based artificial blastocyst P97269EP00. 2013/04/16. Maintained by IMBA.
- Self-assembling tissue modules WO/2009/154466. 2008/06/20.
- Implantable medical devices having recesses US20060184235 A1. 2003/09/04.

### **Book chapter**

**Rivron NC**, Rouwkema J, Truckenmüller RK, van Blitterswijk CA. Cell and Organ Printing. Springer. 2010. What should we print? Emerging principles to rationally design tissues prone to self-organization.

### **Teaching and mentoring**

#### **Post-graduate student trainee**

- 2020 - present. Martina De Santis.
- 2020 - present. Saurabh Pradhan.
- 2019 - present. Jinwoo Seong.
- 2019 - present. Harunobu Kagawa.
- 2019 - present. Alok Javali.
- 2019 - present. Heidar Heidari Khoei
- 2018 – 2019. Delia Koning. Metabolic activity and stem cell differentiation.
- 2016 – 2017. Erik Jacob Vrij. 3D high content screening for primitive endoderm differentiation.

#### **Graduate Student trainees**

- 2021 - present. Theresa Sommer.
- 2019 - present. Viktoria Holzmann.
- 2019 - present. Giovanni Sestini.

2016 - 2018. Linfeng Li. Computational approaches to morphological profiling of stem cells.

2013 - 2019. Javier Frias-Aldeguer. The ground state of trophoblast stem cells.

2011 - 2016. Erik Jacob Vrij. 3D high content and high throughput imaging.

### **Undergraduate Student Trainees**

2021. Samaneh Alinaghian Elyaderani

2021. Julia Cernusca

2020. Theresa Sommer.

2016. Maarten Kip.

2015. Franck Darmis.

2012. Anne Dirkse.

2011. Anne Leferink.

2010. Christian Raiss.

2010. Erik Jacob Vrij.

2009. Vedashree Ramakrishna.

### **Lecturing**

2020. Lecture in Stem cell biology, Utrecht University.

2019. Lecture in Stem cell biology, Utrecht University.

2018. Lectures and practicals in Stem cell biology, regenerative medicine, Maastricht University.

2017. Lectures and practicals in Stem cell biology, regenerative medicine, Maastricht University.

2011-2014. Lectures in Biomedical engineering, University of Twente.

2013. Guest lecture in Regenerative medicine, UMC Utrecht.

### **Practice-based learning**

2018. PRA1001. Biological methods. Maastricht University.

2018. PRA1001. Research methods. Maastricht University.

2017. PRA1001. Research methods. Maastricht University.

### **Reviewer**

#### **Editor:**

Associated editor at Sciences Advances AAAS. Stem cells, embryology.

#### **Peer-reviewing:**

Nature, Science, Cell, Nature biotechnology, PNAS, Plos Biology, FASEB, Lab-on-a-chip, Nature communication, Nature scientific reports, Stem cell reports, Frontiers, Advanced Biosystems, Biomaterials, ISSCR annual meeting, and others.

**Grant reviewing:**

ERC grants and several national granting schemes.