

# JOSEPH BRUNET

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ORCID: 0000-0002-8424-9510

## EDUCATION

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| <b>École des Mines de Saint-Étienne, France</b><br>Ph.D. in Biomechanics  | <i>Nov 2017 - Mar 2021</i> |
| <b>Paris Descartes University, France</b><br>Master of Science - MS, Biomedical Engineering - Major in Biomechanics | <i>Sep 2016 - Oct 2017</i> |
| <b>École Nationale Supérieure d'Arts et Métiers, France</b><br>Master's Degree in Mechanical Engineering            | <i>Sep 2014 - Oct 2017</i> |

## RESEARCH EXPERIENCE

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| <b>Interim Director, HOAHub</b>   University College London (UCL),<br><i>Funded by the Chan Zuckerberg Initiative</i>  | <i>May 2025 Present</i> |
| Appointed interim director of the Human Organ Atlas Hub (HOAHub), a major interdisciplinary research infrastructure at UCL and ESRF.   |                         |
| <ul style="list-style-type: none"><li>Provide scientific and strategic leadership of HOAHub, an international initiative enabling open-access, high-resolution 3D imaging of intact human organs using Hierarchical Phase-Contrast Tomography (HiP-CT)</li><li>Coordinate operational activities across partner institutions, including ESRF and eight co-investigator organisations, ensuring alignment with project goals and timelines</li><li>Manage collaboration with over 30 international research groups using HOAHub infrastructure to address biomedical and clinical questions</li><li>Oversee dissemination of imaging data through the public Human Organ Atlas platform (<a href="http://human-organ-atlas.esrf.eu">human-organ-atlas.esrf.eu</a>), supporting research, education, and clinical translation</li><li>Represent HOAHub at international events, oversee reporting and funding coordination, and lead working groups on imaging, biomechanics, and integration with clinical modalities</li></ul> |                         |

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| <b>Senior Postdoctoral Research Associate</b>   University College London (UCL),<br><i>Funded by the Chan Zuckerberg Initiative</i> | <i>Sep 2022 - Present</i> |
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Senior Research Fellow in ultra-high resolution quasi-dynamic X-ray imaging of human organs and joints using synchrotron tomography

- Visiting scientist at the European Synchrotron Radiation Facility (ESRF)
- Locally lead and co-ordinate the development of the HiP-CT technique at ESRF, performing HiP-CT scans using the latest developments
- Managing other UCL staff and students at ESRF (1 PDRA and, act as local UCL manager for ESRF staff funded by UCL (currently 4 staff))
- Ownership of the local activities of the HiP-CT project at ESRF, coordinating interactions with ESRF Staff, the 8 other Co-Investigator organisations, and the over 30 supporting groups
- Technical leadership. To develop and apply imaging analysis techniques, especially digital volume correlation, to interpret quasi-dynamic biological system behaviour
- Coordinate the local budget of UCL at ESRF for the HiP-CT related projects
- Co-supervision PhD/MSc students, acting as local supervisor whilst they are doing placements at ESRF

**Postdoctoral Research Associate** | University College London (UCL),

Sep 2021 - Sep 2022

Funded by the Chan Zuckerberg Initiative

Research Fellow in ultra-high resolution quasi-dynamic X-ray imaging of human organs and joints using synchrotron tomography

- Visiting scientist at the European Synchrotron Radiation Facility (ESRF)
- Preparation of biological human and animal samples for quasi-dynamic biological scanning
- Perform Hierarchical Phase-Contrast Tomography (HiP-CT) scans at the European Synchrotron Radiation Facility (ESRF)
- Development of a quasi-dynamic experimental setup to perform *in situ* testing on coronary stent expansion in a complete heart
- Development and application of imaging analysis techniques, in particular digital volume correlation, to interpret quasi-dynamic biological system behaviour

**PhD Researcher** | École des Mines de Saint-Étienne, France

Nov 2017 - Sept 2021

Funded by the European Research Council

Advisors: Pierre Badel, Éric Maire

Thesis: Understanding the mechanisms of aortic dissection: finite element modeling and *in situ* experimentation with X-ray tomography

- Collection and manipulation of arterial tissue from pigs and rabbits
- Tensile and peeling tests to assess the elastic and fracture properties of the tissue
- Development of a tension-inflation device fitting inside an X-ray tomography setup and its computer interface
- *In situ* 3D imaging of the dissection of pressurized arterial segments by X-ray microtomography and synchrotron-based phase-contrast imaging
- Modeling of the observed failure phenomena using the extended finite element method

**Research intern** | Medtronic, France

Jul 2017 - Nov 2017

Experimental and numerical study on meshes for abdominal hernia repair

- Uniaxial, biaxial, and indentation tests on different type of textiles
- Modeling the observed mesh behaviors with a nonlinear, anisotropic, plastic model

**M.S. Researcher** | École des Mines de Saint-Étienne, France

Jan 2017 - Jul 2017

Advisor: Pierre Badel

Thesis: Investigation of shear delamination during rupture of arterial medial tissue using cohesive numerical model

## PUBLICATIONS

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1. Veerle M. W. Michels, Adam Szmul, Joseph Jacob, Hector Dejea, Bernadette S. de Bakker, Judith A. F. Huirne & **HOAHub Uterine Consortium**. (2026) Mapping the arterial vascular network in an intact human kidney using hierarchical phase-contrast tomography, *Angiogenesis*. 29(3). doi: 10.1007/s10456-025-10004-w.
2. **J. Brunet**, C. L. Walsh, P. Tafforeau, A. C. Cook, K. Engel, A. Bellier, C. Werlein, F. Lnger, J. Jacob, M. Ackermann, D. D. Jonigk, P. D. Lee (2025). Hierarchical Phase-Contrast Tomography: Advancing High-Resolution Imaging of Intact Human Organs, *Grays Anatomy, 43rd edition*. Book chapter.
3. Newham, E., Parmenter, A. L., Chen, J., Disney, C., Snow, T., **J. Brunet**, Vinci, V., Drnec, J., Sherratt, M. J., Hoyland, J. A., Bellier, A., Bay, B. K., Terrill, N., Lee, P. D. & Gupta, H. S. (2025) Multimodal X-ray imaging reveals hierarchical fibre mechanics, *bioRxiv*. Preprint. doi: 10.1101/2025.09.19.677294.

4. **J. Brunet**, Chestnutt, L., Chourrout, M., Dejea, H., Sabarigirivasan, V., Lee, P. D. & Cook, A. C. (2025) Cardiotensor: A Python Library for Orientation Analysis and Tractography in 3D Cardiac Imaging, *arXiv*. Preprint. doi: 10.48550/arXiv.2508.07476.
5. Walsh, C. L., **Brunet, J.**, Stansby, D., Gaisn, G., Zhou, Y., Ackermann, M., ... Lee, P. D. (2025). The Human Organ Atlas. *bioRxiv*, 2025-07.
6. Rahmani, S., Jafree, D. J., Lee, P. D., Tafforeau, P., **J. Brunet**, Nandanwar, S., Jacob, J., Bellier, A., Ackermann, M., Jonigk, D. D., Shipley, R. J., Long, D. A. & Walsh, C. L. (2025) Mapping the arterial vascular network in an intact human kidney using hierarchical phase-contrast tomography, *npj Imaging*. 3(1), p.39. doi: 10.1038/s44303-025-00090-2.
7. Zhou, Y., Aslani, S., Javanmardi, Y., **J. Brunet**, Stansby, D., Carroll, S., Bellier, A., Ackermann, M., Tafforeau, P., Lee, P. D. & Walsh, C. L. (2025) Multiscale segmentation using hierarchical phase-contrast tomography and deep learning, *bioRxiv*. Preprint. doi: 10.1101/2025.05.15.654263.
8. Mirone, A., **J. Brunet**, Boistel, R., Sowinski, M., Berruyer, C., Payno, H., Boller, E., Paleo, P., Walsh, C. L., Lee, P. D. & Tafforeau, P. (2025) Eikonal phase retrieval: Unleashing the fourth generation sources' potential for enhanced propagation-based tomography on biological samples, *Journal of Synchrotron Radiation*, 32(5). doi: 10.1107/S1600577525005223.
9. Yagis, E., Aslani, S., Jain, Y., Zhou, Y., Rahmani, S., **J. Brunet**, Bellier, A., Werlein, C., Ackermann, M., Jonigk, D., Tafforeau, P., Lee, P. D. & Walsh, C. (2024) Deep learning for 3D vascular segmentation in hierarchical phase contrast tomography: a case study on kidney, *Scientific Reports*, 14(1), p. 27258. doi: 10.1038/s41598-024-77582-5.
10. **J. Brunet**, Walsh, C., Tafforeau, P., Dejea, H., Cook, A., Bellier, A., Engel, K., Jonigk, D. D., Ackermann, M. & Lee, P. D. (2024) Hierarchical phase-contrast tomography: A non-destructive multiscale imaging approach for whole human organs, *Developments in X-Ray Tomography XV*, Vol. 13152, pp. 1315216. SPIE. doi:10.1117/12.3028717.
11. Jain, Y., Walsh, C. L., Yagis, E., Aslani, S., Nandanwar, S., Zhou, Y., Ha, J., Gustilo, K. S., **J. Brunet**, Rahmani, S., Tafforeau, P., Bellier, A., Weber, G. M., Lee, P. D. & Brner, K. (2024) Vasculature segmentation in 3D hierarchical phase-contrast tomography images of human kidneys, *bioRxiv*. Preprint. doi: 10.1101/2024.08.25.609595.
12. Verleden, S. E., Urban, T., **J. Brunet**, Wen, W., Peeters, D. J. E., Lapperre, T. S., Walsh, C., Tafforeau, P., Dejea, H., Jonigk, D., Ackermann, M., Van Hoorenbeeck, K., Lee, P. D., Jacob, J. & Hendriks, J. M. H. (2024) Imaging three-dimensional airway morphology in congenital pulmonary airway malformation using hierarchical phase-contrast tomography, *American Journal of Respiratory and Critical Care Medicine*. doi: 10.1164/rccm.202403-0509IM.
13. **J. Brunet**, Cook, A. C., Walsh, C. L., Cranley, J., Tafforeau, P., Engel, K., Berruyer, C., Burke OLeary, E., Bellier, A., Torii, R., Werlein, C., Jonigk, D. D., Ackermann, M., Dollman, K. & Lee, P. D. (2024) Multidimensional analysis of the adult human heart in health and disease using hierarchical phase-contrast tomography (HiP-CT), *Radiology*, 312(1). doi: 10.1148/radiol.232731.
14. Xian, R. P., **J. Brunet**, Huang, Y., Wagner, L. W., Lee, D. L., Tafforeau, P. & Walsh, L. C. (2024) A closer look at high-energy X-ray-induced bubble formation during soft tissue imaging, *Synchrotron Radiation*, 31(3), pp. 566577. doi:10.1107/s160057752400290x.

15. **J. Brunet**, Walsh, C. L., Wagner, W. L., Bellier, A., Werlein, C., Marussi, S., Jonigk, D. D., Verleden, E. S., Ackermann, M., Lee, D. P. & Tafforeau, P. (2023) Preparation of large biological samples for high-resolution, hierarchical, multi-modal imaging, *Nature Protocols*, 18, pp. 14411461. doi: 10.1038/s41596-023-00804-z.
16. Ackermann, M., Tafforeau, P., **J. Brunet**, Kamp, J. C., Werlein, C., Khnel, M. P., Jacob, J. et al. (2023) Comment on: Intrapulmonary shunt and alveolar dead space in a cohort of patients with acute COVID-19 pneumonitis and early recovery, *European Respiratory Journal*, 61(2). doi: 10.1183/13993003.02121-2022.
17. **J. Brunet**, Pierrat, B., Adrien, J., Maire, E., Curt, N., Bravin, A., Laroche, N. & Badel, P. (2022) In situ visualization of aortic dissection propagation in notched rabbit aorta using synchrotron X-ray tomography, *Acta Biomaterialia*, 155, pp. 449460. doi: 10.1016/j.actbio.2022.10.060.
18. **J. Brunet**, Pierrat, B. & Badel, P. (2021) A parametric study on factors influencing the onset and propagation of aortic dissection using the extended finite element method, *IEEE Transactions on Biomedical Engineering*, 68(10), pp. 29182929. doi: 10.1109/TBME.2021.3056022.
19. **J. Brunet**, Pierrat, B., Adrien, J., Maire, E., Curt, N. & Badel, P. (2020) A novel method for in vitro 3D imaging of dissecting pressurized arterial segments using X-ray microtomography, *Experimental Mechanics*, 61, pp. 147157. doi: 10.1007/s11340-020-00645-x.
20. **J. Brunet**, Pierrat, B. & Badel, P. (2021) Review of current advances in the mechanical description and quantification of aortic dissection mechanisms, *IEEE Reviews in Biomedical Engineering*, 14, pp. 240255. doi: 10.1109/RBME.2019.2950140.
21. **J. Brunet**, Pierrat, B., Adrien, J., Maire, E. & Badel, P. (2019) A combined experimental-numerical lamellar-scale approach of tensile rupture in arterial medial tissue using X-ray tomography, *Journal of the Mechanical Behavior of Biomedical Materials*, 95, pp. 116123. doi: 10.1016/j.jmbbm.2019.03.028.

## INVITED TALKS

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1. "Pushing the limits of HiP-CT: challenges and opportunities in large-volume biological X-ray imaging" Oral presentation delivered at the **Hard X-ray imaging of biological soft tissues symposium 2025**, Crick Institute, Londres, UK. Date: October 13th, 2025
2. "Near-cellular to Whole Organ Quantitative Mapping of the Human Heart Using Hierarchical Phase-Contrast Tomography" Oral presentation delivered at the **BioMedEng25**, Glasgow University, Glasgow, UK. Date: September 5th, 2025
3. "In-Depth Imaging of the Whole Human Adult Heart via Hierarchical Phase-Contrast Tomography" Invitation for oral presentation at **The power of scattering and imaging in understanding and treating disease** conference organized by the LINXS institute, given at Lund University, Lund, Sweden. Date: November 25th, 2024
4. "Overcoming Data Analysis Challenges: Advancing Deep Learning-Based Segmentation in HOAHub Datasets" Invitation for oral presentation at the **Advancing Medical Imaging - Integrating AI and Data Sharing for the Human Organ Atlas Hub** workshop organized by the Center for Quantification of Imaging Data from MAX IV, given at the Technical University of Denmark, Copenhagen, Danemark. Date: November 26th, 2024
5. "Exceptionally detailed Analysis of Whole Human Adult Heart Using Hierarchical Phase- Contrast Tomography" Oral presentation delivered at the **BioMedEng24**, Queen Mary University of London, London, UK. Date: September 7th, 2024

6. "Creating The Human Organ Atlas with HiP-CT" Invitation for oral presentation at the **SPIE Optics + Photonics**, San Diego, United-States. Date: August 23th, 2024
7. "Creating The Human Organ Atlas with HiP-CT" Invitation for oral presentation at the **Big Data and Big Science** workshop organized by University of the Witwatersrand, Johannesburg, South-Africa. Date: May 8th, 2024
8. "Human Organ Atlas project : High-resolution imaging of whole human organs and application on COVID-19" Invitation for oral presentation at the **XXVIimes Journes Francophones de Virologie**, Brussels, Belgium. Date: April 11th, 2024
9. "In situ quantification of the mechanical behavior of arteries using synchrotron X-ray tomography" Invitation for oral presentation at the **GDR Matriaux Fibreux - Caractrisation, modlisation et optimisation (GDR CNRS FIBMAT)**, Lyon, France. Date: December 1st, 2023
10. "Hierarchical Phase-Contrast Tomography for High-Resolution imaging of Ex Vivo Whole Adult Human Heart in Health and Disease" Oral presentation delivered at the **BioMedEng23**, Swansea University, Swansea, UK. Date: September 14th, 2023
11. "BM18, the new ESRF-EBS beamline for multiresolution phase-contrast tomography on large samples : past, present and future" Invitation for key-lecture presentation at the "High-resolution imaging in correlative workflows" workshop organized by Zeiss given at the **Technical University of Munich**, Munich, Germany. Date: July 3rd, 2023
12. "X-ray imaging at BM18 - Human Organ atlas project" Seminar given at **Ecole des Mines de Saint-Etienne**, Saint-Etienne, France. Date: July 3rd, 2023
13. "Imaging of whole human organs using Hierarchical Phase-Contrast Tomography (HiP-CT)" Invitation for oral presentation at the **6th Annual Workshop on Advances in X-ray imaging**, Harwell, UK. Date: June 22nd, 2023
14. "Human Organ Atlas project: Whole Human Organs Imaged in Synchrotrons" Invitation for oral presentation at workshop ("**3D image analysis From Foundation to Vision**") at the Center for Quantification of Imaging Data from MAX IV (QIM), Copenhagen, Denmark. Date: March 10th, 2023
15. "Imaging of whole human organs using Hierarchical Phase-Contrast Tomography (HiP-CT)" Oral presentation delivered at the ImagingBioPro Network Workshop (Leveraging Next-Gen Multiscale Imaging at Central Facilities for Biomedical Engineering Research) at the **BioMedEng22**, University College London, London. Date: September 9th, 2022
16. "In situ quantification of the mechanical behavior of coronary arteries during angioplasty using synchrotron X-ray tomography in intact porcine hearts" Oral presentation delivered at the **BioMedEng22**, University College London, London. Date: September 9th, 2022
17. "Imaging of whole human organs using Hierarchical Phase-Contrast Tomography (HiP-CT)" Seminar given at **Witwatersrand University**, Johannesburg, South Africa. Date: September 6th, 2022
18. "High-resolution imaging of the whole human heart using synchrotron x-ray tomography" Oral presentation delivered at the **5th International Conference on Tomography of Materials and Structures (ICTMS)**, Grenoble, France. Date: July 25th, 2022

19. "3D characterization of crack propagation during the onset of a dissection using X-ray microtomography on pressurized aortic segments" Oral presentation delivered at the **26th Congress of the European Society of Biomechanics**, Online. Date: July 13th, 2021
20. "Hierarchical imaging of complete human organs, how the EBS changed the game" Oral presentation at the **Science Day Symposium**, ESRF, France. Date: March 21st, 2022
21. "Investigation of notch propagation in an in-vitro dissection model using X-ray microtomography" Oral presentation delivered at the **45th Congress of the Societe de Biomecanique**, Online. Date: October 27th, 2020
22. "A numerical design of the experiment approach to understand aortic dissection onset and propagation" Oral presentation delivered at the **44th Congress of the Societe de Biomecanique**, Poitiers, France. Date: October 29th, 2019
23. "Chairman of the session 'Macro-scale biofluids'" **44th Congress of the Societe de Biomecanique**, University of Poitiers, France. Date: October 28th, 2019
24. "A new approach combining experiment and numerical simulation using a cohesive interface to model tensile failure in arterial medial tissue at the meso-scale" Poster presentation delivered at the **8th World Congress of Biomechanics**, Dublin, Ireland. Date: July 9th, 2018
25. "Characterization and modeling of rupture in arterial medial tissue under tension from in situ experiments with X-ray tomography" Oral presentation delivered at the **15th International Symposium on Computer Methods in Biomechanics and Biomedical Engineering**, Lisbon, Portugal. Date: March 28th, 2018

## GRANTS

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- 2025 Biomedical Challenge Beamtime (HOAHub) **ca. £40,000 worth of beamtime, co-PI**
- 2024 - Feasibility beamtime (HOAHub) - **ca. £20,000 worth of beamtime, PI**
- 2024 Human Organ Atlas Hub (HOAHub) **ca. £1,000,000 worth of beamtime, Co-investigator**
- 2023 HiP-CT beamtime MD-1290 (12 beamtimes) **ca. £1,000,000 worth of beamtime, Co-investigator**
- 2022 Proof of Concept Awards (PoCAs) delivered by ImagingBioPro Network. **£25,000 PI**
- 2020 - ESRF Beamtime LS-2904 - **ca. £80,000 PI**

## TRAVEL GRANTS

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- 2025 CZI Imaging the Future 2025: Focusing on Biology in Action, San Jose, US **£2,000**
- 2024 CIFAR MacMillan Multiscale Human Spring 2025, Geneva, Switzerland **£1,500**
- 2024 CZI Imaging the Future 2024: Life Illuminated, Austin, US **£2,000**
- Travel Grants for Invited Talks (6 - equivalent to approx. **£3600**)  
Awarded travel grants to present research at international conferences or workshops *2018 - 2024*

## TEACHING EXPERIENCE

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| <b>Co-Supervisor of 1 PhD student, UCL</b>                                   | <i>2024 - 2025</i> |
| Projects: New device for coronary arteries mechanical characterization       |                    |
| <b>Correction of 3rd-year project thesis - UCL</b>                           | <i>2023 - 2025</i> |
| Correction for the Cardiovascular Science MSc                                |                    |
| <b>Co-Supervisor of 6 MS students, ESRF/UCL</b>                              | <i>2021 - 2023</i> |
| Projects: Mechanical testing / Image processing and analysis / Deep learning |                    |
| <b>Provide training to PhD students and Post docs at ESRF</b>                | <i>2021 - 2023</i> |
| Subjects: sample preparation, scan acquisition, image reconstruction         |                    |
| <b>Supervisor of 2 MS students, École des Mines de Saint-Étienne</b>         | <i>2018 - 2020</i> |
| Industrial and research projects   |                    |
| <b>Teaching Assistant, École des Mines de Saint-Étienne (140 hours)</b>      | <i>2018 - 2020</i> |
| Courses: Experimental mechanics, Finite element method                       |                    |
| <b>Tutor for students in difficulty, Saint-Exupery middle school, Macon</b>  | <i>2015 - 2016</i> |
| Courses: Mathematics and Physics   |                    |

## AWARDS

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| <b>1st prize poster competition (£300).</b> | CiET Mid-term review, University College London. March, 2024 |
| <b>Camille Mathieu Award (5000€).</b>       | Handitecam, Arts et Mtiers. December, 2017                   |

## PROFESSIONAL AND INSTITUTIONAL ROLES

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| <b>UCL representative at at ESRF</b>   | <i>2023 - 2025</i> |
| Locally lead and coordinate research activities, provide assistance to new staff for settling in, facilitate collaboration between UCL and ESRF teams, and ensured smooth operational workflows. |                    |
| <b>Responsible for health and safety compliance of the project at ESRF</b>   | <i>2021 - 2025</i> |
| Handling human organ samples, dealing with substances like ethanol, formalin, and the inherent risks of X-ray radiation  |                    |
| <b>Guest Lecturer in Engineering Schools</b>   | <i>2022 - 2024</i> |
| Delivered presentations on current research and academic opportunities in the sciences to undergraduate engineering students. Aims to inspire students to consider careers in academia.          |                    |
| <b>PhD student representative</b>  | <i>2018 - 2020</i> |
| Board of the Doctoral School of Science, Engineering and Health of the University of Lyon  |                    |
| <b>PhD student representative</b>  | <i>2018 - 2020</i> |
| Board of SAINBIOSE laboratory (INSERM)   |                    |
| <b>President of the Saint-Étienne Doctoral Students' Club</b>  | <i>2018 - 2019</i> |

## PROFESSIONAL AFFILIATIONS

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| <b>Member of European Society of Biomechanics</b> | <i>2020 - Present</i> |
| <b>Member of French Society of Biomechanics</b>   | <i>2020 - Present</i> |

## REFERENCES

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| Peter Lee, Prof<br>Dept of Mechanical Engineering<br>University College London, UK | Phone: +44 1235 567789<br>Email: peter.lee@ucl.ac.uk |
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