Dr. Théo ASPERT
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Strasbourg (France), 28th of June, 2022

Pr. Dr. José Luis García-Cordero

Cover letter for a post-doc/ research-engineer position in your group

Dear Pr. Dr. García-Cordero,

I am taking the opportunity to contact you to express my utmost interest in a **post-doc/ research engineer (or similar) position in your group**.

I am a bioengineer who has grown a particular interest in measuring the dynamical behavior of single-cells in different contexts by developing and using microfluidics, imaging, and deep-learning methods. Besides **fundamental research**, I am now enthused by **translational research** and in particular by **personalized medicine** and **drug screening.** In this context, I am especially interested in organoids as they are a good compromise between **reductionism and controllability,** and **physiological relevance.** Moreover, this powerful model can be further controlled, made reproducible, or complexified using microfabrication technologies (allowing shape modulation or long-term co-cultures with other cell types, eg: Gjorverski et al., Science 2022, from the Lütolf lab & Ronteix et al. Nat Comm 2022 from the Baroud lab). This ability to reliably reproduce complex environments and mimic organs further confirms their potential to revolutionize tomorrow's drug discovery and translational science. Considering my background and prospects, your group and the environment that the ITB is setting up appear to me as a keystone in my career and I am highly motivated to engage in this inspiring approach.

In fact, after a **master's degree in biomedical engineering** and a **master of science (spe. in nanobiology)**, during which I acquired knowledge at the frontier between biology, physics, and engineering (see CV for more details), I pursued a **PhD in biophysics** in the lab of Pr. Dr. Gilles Charvin (department of Stem Cells and Development of IGBMC) to study the **dynamics and heterogeneity of replicative aging**, using the asymmetrically dividing eukaryote *S. cerevisiae*. Just like many diseases, cellular aging is a very dynamic process with high cell-cell heterogeneity and different possible fates, and observing single cells throughout their entire lifespan is required to properly understand the paths that one cell can take. To this end, I developed a **microfluidic device to trap and isolate single-cells while they divide, from birth to death (3-4 days)**. Coupled with a **high-throughput custom-made microscope**, I was able to capture more than **30 000 cellular lifespans per experiment** (gain of 1-2 orders of magnitude compared to published approaches). To analyze this quantity of data, I also developed a **deep-learning-based software to detect cell divisions and cellular contour**, **allowing automated replicative lifespan assays** (see doi.org/10.1101/2021.10.05.463175, in press in Elife). By using this system, I was able to measure the statistics of a well-known keystone event occurring in most aging cells, and showed, against the dogma, that the occurrence of this event was independent of age (paper in preparation) (see the full list of publications and projects at taspert.github.io/Publications and /Research).

For similar dynamics reasons, I also developed a microfluidic device and timelapse pipeline to **track single-cells entering into quiescence** (for up to 10 days), showed that a high heterogeneity existed regarding this entry, and determined its origin (see elifesciences.org/articles/73186, co-first authorship).

Aside from my own projects, I **collaborated with more than 9 teams** (see taspert.github.io/Research#collabs), to set up innovative and user-friendly solutions to track single objects over extended periods (such as single mouse embryonic stem cells, *C. elegans* worms, *S. Pombe,* or single axons). To interact with people, understand their technical needs, define criteria of success before designing a device and/or an experiment, was a very exciting part of my thesis.

Notably, most of the projects from my academic experience involved acquiring large amount of data and reproducibility. Thus, I also developed several tools based on robotics, electronics and 3D printing to successfully automatize and standardize experiments (such as heating systems, automated pumps and fluids control or microscope interfacing).

Overall, I have expertise in **microfluidics**, **long-term microscopy**, **bioimage analysis**, **deep-learning**, **data science, automation,** and **single-cell dynamics**. As a biomedical engineer and biologist, I also have an interest in health and translational science which is what motivates me towards the next direction of my career, as mentioned in the introduction. Moreover, I think my **interdisciplinary** expertise would integrate very well into your team's spirit and the ITB environment, whilst keeping some complementarity.

I would therefore be delighted to discuss further during an interview how we could work together. In the meantime, you can find more information about me at **taspert.github.io** and in the **enclosed CV**.

Thank you for your consideration.

Yours sincerely,

Théo ASPERT

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