Ludivine Roumbo

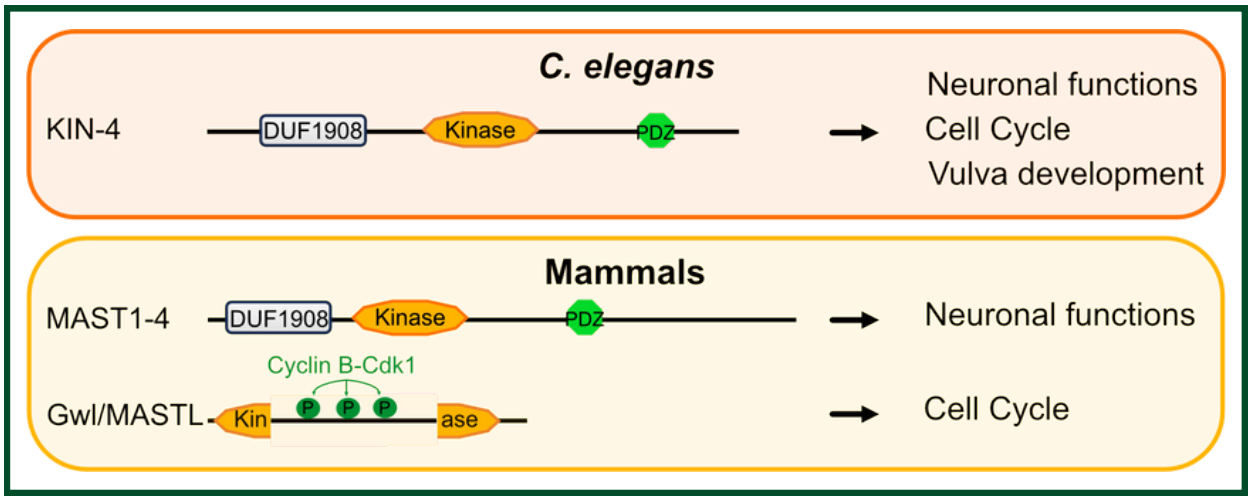
Trusting the process: KIN-4, cell cycle control, and seeing what unfolds

BioSPC MECA department, graduated PhD from the team "Cell Cycle and Development" at Institut Jacques Monod - Thesis directors : Batool Ossareh-Nazari and Lionel Pintard

THE MAST KINASE KIN-4 CARRIES OUT MITOTIC ENTRY FUNCTIONS OF GREATWALL IN C. ELEGANS
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Abstract: MAST-like, or Greatwall (Gwl), an atypical protein kinase related to the evolutionarily conserved MAST kinase family, is crucial for cell cycle control during mitotic entry. Mechanistically, Greatwall is activated by Cyclin B-Cdk1 phosphorylation of a 550 amino acids-long insertion in its atypical activation segment. Subsequently, Gwl phosphorylates Endosulfine and Arpp19 to convert them into inhibitors of PP2A-B55 phosphatase, thereby preventing early dephosphorylation of M-phase targets of Cyclin B-Cdk1. Here, searching for an elusive Gwl-like activity in *C. elegans*, we show that the single worm MAST kinase, KIN-4, fulfills this function in worms and can functionally replace Greatwall in the heterologous Xenopus system. Compared to Greatwall, the short activation segment of KIN-4 lacks a phosphorylation site, and KIN-4 is active even when produced in *E. coli*. We also show that a balance between Cyclin B-Cdk1 and PP2A-B55 activity, regulated by KIN-4, is essential to ensure asynchronous cell divisions in the early worm embryo. These findings resolve a long-standing puzzle related to the supposed absence of a Greatwall pathway in *C. elegans*, and highlight a novel aspect of PP2A-B55 regulation by MAST kinases.

Graphical Abstract:



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In a few words, what's the take home message from your paper ?

Basically, what we found is that there is a Greatwall-like pathway in *C. elegans*, which involves a MAST kinase. This kinase, called KIN-4 in *C. elegans*, phosphorylates ENSA-1 to inhibit PP2A-SUR-6. So, we show that this pathway is present and is essential to maintain mitosis asynchrony when we have dysregulation of the phosphatase acctivity. We also show that this pathway has other functions: it regulates the development of vulva, and it has also been shown before that KIN-4 plays a role in neurons in *C. elegans*. With all that, we see that one kinase in *C. elegans* endorse the role of all four MAST kinases in human, because in human and mouse, there's Greatwall, which does only cell cycle, and MAST kinases 1 to 4 seem to mostly have a neurotypical job. So, KIN-4 kinase in *C. elegans* has different roles, that's quite cool.

For this paper, how long did the publishing process take?

So the publication took time. Basically, there were two things. First, the "EMBO Journals" do just one round of revision. So we submitted the paper in July, we had the reviewers comments back in August and we had until November to do some revisions. I only had two experiments to do, and we also had to explain things, just like you normally answer the reviewers point by point. It was a lot of minor requests or changes, which was okay. For the experiments, I had to build it up to respond to some questions. Some experiments were working and some did not work at all because of technical issues, and we were not able to fix it. But we still built a complete response for everything and we send it back on time in November. It was under editorial consideration for a bit of time, because they sent the response back to the reviewers, and then it was accepted in December. However, the second thing is that, between December and February it got lost, somehow. That was not a discussion between us and the journal, it was just the editorial process I guess. We don't really know, but we just knew that it was taking a bit of time, and it took some time to be published.

What do you consider the most challenging part of your work ?

The worms were thermosensible mutants, sensitive to temperature, which was not really a challenge, because we know how to deal with them, but then you have to be sharp. And, it was sometimes trouble because of room temperature manipulation. It happened that the experiment was not going well, and then you're losing like a week. But overall, we didn't have that many failures. We focused on the main story and it worked out the first time, so it was really, really cool, but it was, really a hard job, because the mutants were very... mutant [laugh]. I remember an experiment where division timing of the embryos was very much an issue, because depending on the temperature of the room I was filming in, I had variability on that division timing. And the tricky part was that you don't know that you have variability when you film an embryo that's dividing, because it takes, like, 30 minutes, which is quite rapid. But when after analysis we realized that there was a lot of variability, we had to verify the strains before thinking about temperature. We need to verify everything around, so that takes time. The solution was to increase the number of embryos to reduce the variability. But more embryos means more time to film. I remember the period I was filming, I was starting at 7AM in the morning filming embryos, and leaving at 8PM, with like 30 minutes to eat in the day. It was really, really long days, but then when you get the results, you're happy. And this happened for everyone, I think. I believe all PhD students can relate on that experiment that they have to do, and that takes so much time, and you have to redo them again and again. So, that's part of the job, but that's still hard.

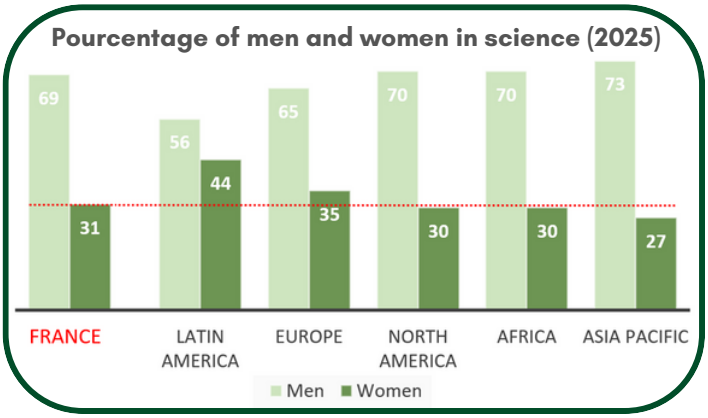
"I believe all PhD students can relate on that experiment that they have to do [...] again and again. So, that's part of the job, but that's still hard."

You won the L'Oréal award for your work. Can you explain what it is ?

The price is the "L'Oréal-UNESCO for Women in Science, Young Talent France". It is for women in science every year and is awarded to PhD students and postdocs. Each year, they give 30 prizes in France and 5 in ultramarine world. Please, candidate every year. This is important, because if you don't try it, then you won't get it. Easy. That's exactly what I heard, and so that's why I tried. This prize is to encourage women to continue in science and to launch their career, because in France we have 31% of women that are in science, across all fields. That's really weak and it's below the European percentage, which is 35%. It drops even more when you search for women at head of institutes and I think it's just 4% of women that win Nobel Prizes.

What are the requirements to apply ?

For this prize, the requirements are to be at least in the second year of a PhD and to have a paper ready to be submitted, submitted or accepted.



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What was the biggest challenge of the application process ?

The application is really an academic type. They ask for your paper, abstracts, a list of the talk and the poster that you have done, and a good CV. I worked on the application for about a week, and mostly on the abstract because it had to be vulgarized enough for people to understand. The first jury were people in my field, but the final jury was from "Académie des Sciences". They are academicians of course, but from all fields so they are not specialists, but they still need to understand my science. So that was the biggest challenge. However, I really liked this vulgarization part to a larger public, because I think it's important for me that people like friends or our family, understand what I'm doing. In the lab and in the institute, we organize visits, and sometimes, high school or univeristy students are coming, or even, public for "Journées de la Science", for example. So, you need to understand that those people have some range of knowledge about science and biology, but not in your field, so this is important to know to take some steps back, to analyze and search your words, and honestly, once you get the catch it's always the same, so it's easier. But, for example, the foundation also helps you to understand what are the keys of communication and that's valuable.

What did winning the prize bring you ?

Winning this price was a really a great experience. It is a 3 to 4 days formation about gender equality, women in science, leadership, how to talk to people, how to make a great talk, how to negotiate and many other topics. The training was on very diverse subjects which was really nice. And the price helps you concretely to make your science better, because it's 15 000 euros for PhD students and 20 000 euros for postdocs. Thanks to this, for example, I'm able to go to the ASCB and EMBO Cell Bio Meeting and I can afford other trainings for myself. It was actually the first time for me to be a candidate, and it worked, which shows that it can happen to anyone.

What do you think contributed to your success in receiving the award ?

I had a lot of help from my whole lab. My supervisor wrote a recommendation letter for me and people were encouraging me. But the reality is that at first I did not think that I was going to win, I just thought that it was a good experience for me to write in French. However, I won because the article was published, the science was quite cool and also because I have an associative engagement. And the Fondation l'Oréal emphasizes both scientific excellence, diversity and engagement.

"Please, candidate every year [...] because if you don't try it, then you won't get it."

More about Ludivine's journey

What drove you to do a PhD in the first place ?

I always liked science and I have always been interested in how things work. I believe that's why I did biology, and then more cellular biology and biochemistry, because you get to see mechanistically how things work. I really liked my Master 2. It was very much about being in the lab, seeing people working around, having a big question, and having your own project. I liked that, and that's why I did a PhD.

"If you don't have it [doctoral school funding], it doesn't mean that your PhD journey is completely done."

How did your academic journey lead you to your PhD ?

I studied at Sorbonne University for my License and Master degree, and then I came to University Paris Cité for my PhD. And, fun fact: during my Master 2, I was working in the same lab, but under another supervision and on a different project. I was working on microtubule enzymes, that cuts microtubules to generate more microtubules. I presented this project for the doctoral school competition. But because of my grades, I did not pass the selection and did not make it to the oral presentation. So I had to leave the lab, say goodbye to everyone and look for something else. While I was looking for another lab, my current PI, who is the head of my lab, contacted me and said "Hey, I have a funding for this other project". The project was not what I used to do, but I still accepted because it was cool and it was the same techniques that we used in the lab, so I was quite familiar with the model. Then I came back with a funded project, and then I won the prize! So even if you are not accepted by the doctoral school, there is still hope. If you don't have it, it doesn't mean that your PhD journey is completely done.

How did you handle your work-life balance throughout your PhD ?

Work-life balance is hard to maintain during a PhD, this is not a classical job. I mean, it's more than that. And sometimes it demands more work. My first year of PhD was really intense, and I did not have a very good balance. I was working really hard but I wanted to do something more and have more balance. So I joined an association, which is "Protection civile" as a first responder. I had the training and during one week I learned about how to rescue people. We have a diversity of things that we can do, you meet people from different backgrounds and I really wanted to help people. With this associative life and the obligations, I have to leave work at 5 or 6 on specific days, because I have this action planned tonight and I took the engagement to go. It helped me organizing more my day and my weeks to fit everything in, so that was a great deal for me to balance a bit.



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Looking back, what have you learned during your PhD and from your achievements ?

What I learned from my PhD is mainly a lot of theory, critical thinking, and experimental skills. You do things for yourself and have to lead a project in a timing that you can't delay. I also had the chance to directly manage a student during 6 months, which taught me a lot about management, how to focus on your own stuff plus someone else's project, and how to balance both. The l'Oréal-UNESCO prize taught me a lot about myself, realizing that I was able to do all of that and that I did a great job.

Do you feel that the PhD prepared you for what you want to do next?

To be honest, I don't know what I will do after my PhD. But at least now I know how to manage a project. During the second part of my PhD, I started my own little project, so I had my own question and managed the experiments that I wanted to do. And I also had my thesis, so I learned about planification and organization. I think these skills are important if I want to do a postdoc, but also if I want to go into industry or the private sector. Overall, I think these are very good skills that I developped.

> **“ The prize taught me a lot about myself, realizing that I was able to do all of that and that I did a great job. ”**

What would you advise PhD applicants and 1st year PhD students?

[For PhD applicants] The first thing, the most important thing when you think about doing a PhD, for me, is to know where you're going. So, knowing your lab, knowing the people in the team where you're going is really important. I think this is crucial.
Then the second part is what you will actually do during your PhD. Do the techniques and the experiments that the lab is doing fit with you? Do you like it? Will you like it for 3 years? Because you do that for at least 3 years. You don't change every 2 days the type of experiment by yourself. You can have collaborations, but still. And the third thing is your project, but mainly, if you like a bit the discipline of the project, you will finish by loving your own project anyway.

[For 1st year PhD students] Courage. Courage. The thing is that you need to go with the flow, because a PhD, even if you want to have this work-life balance, work will always take a bit more. In Paris, everything is very competitive, all the institutes are very high level and they are all demanding. All the projects nowadays are ambitious, so it's demanding a lot. It's important to take time for yourself. For example, the weekends. Don't go to work on the weekends... at least if you can, because if you work with cells, then the cells don't wait for you. If you can't balance on work-life, try to work on organization. Because if you know how to organize yourself, you won't waste time. Or at least you will waste less time. The mistake is to put too many things in your day. If you want to do 3 experiments in one day, saying like “oh, there's incubation time here, so I can start this” it might not be working in reality. Also, biology is not always working on time, we work with living organisms. Be patient with yourself and don't overbook yourself. Learn about yourself and how to organize yourself. I say it a lot because organization for me is the key to maintain this balance, and to not have too much work and overloads at the end.

The interview was conducted in November 2025.
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Scientific Highlights - February 2026

Who are we?

We are PhD students from the BioSPC doctoral school and representatives of BioSPC students. We dedicate time and energy to make the PhD journey more pleasant for the most of us and to meet new people who share common interests.

What is this project?

The SciHighlights project comes from the will to highlight the achievements of BioSPC PhD students, make accessible all scientific fields across the doctoral school and share the behind-the-scenes of a thesis path or a publication.

Credits
Interview: Alix MARTIN & Manel BELDJILALI
Transcript*: Laetitia CAMARD
Editing: Alix MARTIN, Manel BELDJILALI & Laetitia CAMARD
Figure: Alix MARTIN
*AI was used to generate the transcript of the interview

Want to be part of the editing team?
Have an achievement to highlight?