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Integrating forces and signalling for cell polarity and migration

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Alba Diz-Muñoz did her PhD as a joint grad student in the laboratories of Dr. Paluch and Dr. Heisenberg at the MPI-CBG in Dresden. After her PhD, she continued in the group of Dr. Paluch as Postdoctoral Fellow. In 2012, she moved to California and did her postdoctoral studies with the groups of Dr. Weiner at the University of California San Francisco (UCSF) and Dr. Fletcher at UC Berkeley. Since spring 2016, Alba Diz-Muñoz is a Research Group Leader at the EMBL in the Cell Biology and Biophysics Unit, in Heidelberg.

Career advice:

5 take home messages I gave during the PhD ceremony apply at any career stage so here they are:
• Go on an adventure and pick a challenging project, those are the worthy ones. At the overlap between scientific disciplines there is a lot of cool science to be discovered.
• Be curious
• Pick good mentors, they might just save you from embarrassment when you get a job interview
• Remember that self doubt is a sign of wisdom but don't let it put you down for too long.
• Try! you might just be surprised!

Abstract:

Cells are now broadly appreciated to be mechanical as well as biochemical systems. They generate, transmit, and respond to forces through an intricate network of mechanical components, resulting in cell movement and shape change, as well as altered signalling, modulated expression, and even genomic damage. Contributions to cell mechanics from molecular motors, cytoskeletal filaments, and mechanosensitive proteins have received significant attention, and the cell surface – comprising the plasma membrane and underlying cortical cytoskeleton – has emerged as a unique mechanical system capable of exerting both local and global control of cell form and function. The physical properties of the cell surface can be rapidly modulated, enabling cells to generate or accommodate changes in shape.

Here, I will present our work on the role of membrane-to-cortex attachment in the control of directional persistence during mesendodermal cell migration during zebrafish development, and show that neutrophil migration requires inhibition of actin polymerization via PLD2 and mTORC2 downstream of changes in membrane tension.

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