

Alma Dal Co (1989–2022)

By Simon van Vliet & Martin Ackermann

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A visionary and interdisciplinary scientist who brought a fearless passion to everything she did, inspiring all those around her.

Alma Dal Co tragically passed away on 14 November 2022 at the age of 33, doing what she loved most – spearfishing near the Italian island of Pantelleria. Alma was a visionary scientist at the beginning of what was promising to become a stellar career. As a physicist turned biologist, Alma wanted to unravel how complexity emerges from simplicity. Despite her young age, she had already made an important impact on the field by showing how the activities of microbial communities emerge from interactions between individual cells. Alma was a warm and caring friend, and a committed and inspiring mentor. She pursued science with fearless passion, creativity, vision and dedication.

Alma had an exceptionally sharp and creative mind, and an insatiable curiosity. She kept exploring new directions, working on everything from gene-regulatory circuits to microbial communities, to developmental processes. She was the embodiment of a true interdisciplinary scientist, combining state-of-the-art experiments with advanced computational approaches. The unifying theme of her work was to understand how interactions between individuals (be it fish, microorganisms or pancreatic cells) give rise to complex behaviour at higher levels of organization. She strived to derive simple, quantitative rules to explain the complexity that we see around us. Alma believed that science is a team effort: she was generous with her time, and always happy to discuss ideas and share resources. No matter where she went, she quickly connected with people, built formal and informal networks, and fostered collaborations and friendships.

Alma was born in Turin and grew up in Venice, in Italy. Her true home, however, was Pantelleria, an Italian island in the Mediterranean Sea off the coast of Sicily. Alma spent her summers in the sea from an early age, developing a deep and lasting bond with it. The sea was not only a place to



Alma Dal Co in 2016 in Joshua Tree National Park, California. Photograph by Simon van Vliet.

recharge, but also a source of inspiration: Alma became fascinated by the intricate behaviours of octopuses and schools of fish, creating a lasting sense of wonder about the natural world. Alma's primary education focused on the humanities, but most of all music. In 2002, she was accepted to the conservatorium in Venice to study the piano. However, her love for the natural world remained and in 2007 she started studying physics in Padua. In 2011, she finished her BSc in physics and a year later her education at the conservatorium. Both a career in music and in science were an option, but Alma chose science and moved to Turin to study the physics of complex systems. Music always remained important in her life, and she played the piano whenever she could.

Alma's transition to biology started in Turin in the laboratory of Michelle Caselle, where she used mathematical models to study gene regulatory networks. She discovered how the regulation of gene expression can reduce stochastic fluctuations and provide robustness to the expression of an organism's phenotype (A. Dal Co et al. *Nucleic Acids Res.* **45**, 1069–1078; 2017). In 2014, she exchanged the blackboard for the wet

lab, and moved to Zurich, Switzerland, to start her PhD with Martin Ackermann at ETH and the aquatic research institute Eawag. Despite the struggles of having to learn hands-on biology without formal training, she was not deterred from pursuing a highly challenging project.

Alma developed an innovative approach to gain a mechanistic understanding of how metabolic interactions between individual microbial cells determine the dynamics of spatially structured communities. She quantified the growth of single cells in a synthetic microbial community and developed computational tools to infer their interaction network. She showed that cells in these communities live in a small world: they only interact with few neighbours (A. Dal Co et al. *Nat. Ecol. Evol.* **4**, 366–375; 2020). This short interaction range limits the growth of mutually dependent microorganisms, thereby counteracting the evolution of metabolic specialization. Moreover, Alma developed a mathematical framework to quantitatively predict the dynamics of microbial communities from the molecular properties of the underlying intercellular interactions (S. van Vliet et al. *PLoS Comput. Biol.* **18**, e1009877; 2022). Together, these works have made an important contribution to our understanding of how microbial communities function, and they have inspired numerous follow-up projects, both by Alma herself (for example, A. Dal Co et al. *Phil. Trans. R. Soc. B* **374**, 20190080; 2019) and by others in the field (for example, J. van Gestel et al. *Nat. Commun.* **12**, 2324; 2021).

Alma finished her PhD in 2019, winning the ETH medal for an outstanding thesis. She then moved to Harvard to study developmental processes, together with Michael Brenner. She quickly developed a large network of collaborators and designed an innovative project to study pancreatic islet formation. However, COVID-19-related laboratory restrictions brought an early end to these plans, and Alma instead developed a novel computational framework that can be applied to both animal tissues and microbial communities to study how local cell–cell interactions can create spatial structure at the scale of multicellular systems.

In September 2021, Alma started an assistant professorship at the University

of Lausanne. At the age of 32, she was one of youngest professors ever appointed there. Thanks to her leadership, she quickly assembled a highly interdisciplinary, collaborative and cohesive team of talented young scientists. The group's research was as varied as Alma's interests. A major theme was to gain a quantitative understanding of how cell–cell interactions affect the function and structure of microbial communities and other multicellular systems. Her group combines state-of-the art experimental tools such as optogenetics, microfluidics and single-cell imaging, with computational approaches and mathematical modelling to study the dynamics of a wide range of model systems.

During her very short career as an assistant professor, Alma was a core member of the Swiss National Research Program on microbiome research (<https://nccr-microbiomes.ch>); was awarded two major grants; established a large network of collaborators; and was invited to present her work at numerous

international meetings. Most importantly, Alma fostered a strong sense of community, both in her group and beyond – creating an open, inclusive and interactive space to discuss science and life.

Interacting with Alma was never dull: her passion and energy were infectious and her curiosity and openness a source of inspiration. She always kept you on your toes with her constant stream of pointed questions. But most of all, her easy laugh and positive energy made working with her an extraordinarily joyful experience.

With Alma the world has lost a visionary scientist. We are deeply saddened that we will never see what other discoveries she would have made. However, it offers some conciliation to see how profoundly Alma has impacted the people around her, leaving a lasting impression even on those she only briefly met. Her vision, spirit and leadership have profoundly changed many around her and will continue to be a source of inspiration for many years to come.

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Additional information:

S.v.V. is a project leader (SNSF Ambizione Fellow) at the Biozentrum of the University of Basel. He met Alma in 2014, during his PhD, which they did in the same group. They spent the better part of their PhDs discussing science and life, and have been close friends and collaborators ever since. M.A. is the director of Eawag, the Swiss Federal Institute of Aquatic Science and Technology, a professor at ETH Zurich and a professor at EPFL in Lausanne, Switzerland. He was Alma's PhD adviser and remained a close friend and collaborator after Alma graduated and continued her career in Boston and then Lausanne.