



A tribute to Raphaël Boulay (1973 - 2018), a field naturalist and ant researcher who thought broadly and worked internationally

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*Xim wrote a highly personal initial draft of this text. Jessica, one of Raphaël Boulay's former postdocs, then refined the manuscript's structure and flow and significantly contributed to its content.

Renowned French myrmecologist Raphaël Boulay passed away on 27 June 2018. He was only 44 years old, but he was already a prolific researcher. Six days before his death, he was exchanging emails with several colleagues, giving instructions about the Global Ant Genomics Alliance (GAGA) project. This anecdote provides just one example of his passion and optimism. Another example is his response when Xim asked him about his leukaemia diagnosis: "Yes, it's a type of cancer, but it's the kind of cancer that you have a good chance of beating." Shortly after this conversation, Xim and Raphaël travelled together to Morocco for field work. The trip involved driving long distances, punctuated by stops to excavate *Cataglyphis* ant nests. Despite his illness, he continually joked about being stronger than Xim and Fernando Amor, his former graduate student, because he was still able to dig up the nests faster and more efficiently than them.

Xim met Raphaël for the first time in 1995 in Ville-taneuse (Laboratory of Experimental and Comparative Ethology [LEEC], University of Paris 13), where he was doing his master's degree on the ant *Cerapachys biroi* (now *Oocera biroi*) under the supervision of Pierre Jaisson. It was the beginning of an intense scientific career. Raphaël was born in Nogent-le-Rotrou, France, on November 16, 1973. He grew up in a small *bled*, or village, in the same region – Authon-du-Perche. He studied biology at the University François Rabelais of Tours, and then, after completing his master's degree in Paris, he returned to Tours to do a PhD at the Insect Biology Research Institute (IRBI) (known as the Department of Behavioural Sciences, or DESCO, at the time). He focused on the octopaminergic system and its role in social cohesion and recognition in the ant *Camponotus fellah* under



Excavation of a *Monomorium subopacum* colony in an Argan forest in Essaouira, Morocco, in 2006 with Khalid Naamani, Isabel Luque, Raphaël Boulay, Ana Carvajal, and Abderahim El Keroumi (from left to right). (Photo credit: Xim Cerdá)

the supervision of Alain Lenoir. In 2000, he did his first postdoc at Louisiana State University in Baton Rouge, where he worked with Linda Hooper-Bui on the effect of biogenic amines on reproduction in the red imported fire ant. That same year, he travelled to Tel Aviv University for a second postdoc with Abraham Hefetz, participating in research on ant social isolation and honeybee queen signals.

The second time that Xim met Raphaël was in 2001 when he was just finishing up his work in Tel Aviv. He had already secured a new postdoc position in Stefano Turillazzi's lab at the University of Florence, where he would be focusing on wasp pheromones. However, he was very keen to get funding to come to Spain for two main



The LE STUDIUM team during a meeting in Tours, France, in 2014: Paul Graham, Abraham Hefetz, Serge Aron, Xim Cerdá, Raphaël Boulay, and Nicola Fazzalari (from left to right). (Photo credit: Ludovic Michel / Xim Cerdá)



Digging up an *Aphaenogaster iberica* colony near Lanjarón (Sierra Nevada, Spain) in 2015; Raphaël Boulay is the excavator and is surrounded by David Aragonés, Cristela Sánchez Oms, and Carlos Molinas (from left to right). (Photo credit: Xim Cerdá)

reasons. First, and probably foremost, he wanted to be closer to his Spanish girlfriend, Irene Villalta. Second, he wanted to do field work on ant-plant interactions. Xim agreed to write the research proposal for a Spanish fellowship that he was applying for. Raphaël tried to help, but, at that time, he did not know anything about ant seed dispersal and ant-plant ecology. In a matter of a few years, however, he became more of an expert on the topic than Xim! A couple of months later, the grant was funded. In March 2002, Raphaël arrived in Seville. Over the next seven years, he worked as a postdoc at the Doñana Biological Station (*Estación Biológica de Doñana*), an institution run by the Spanish National Research Council (*Consejo Superior de Investigaciones Científicas*, CSIC), with funding that came from a broad variety of sources (i.e., the Spanish Ministry of Education, an EU Marie Curie fellowship, the CSIC's JAE programme, and the Spanish Ministry of Science's Juan de la Cierva programme).

When he applied for a more stable position (a 5-year contract funded by the Spanish Ramón y Cajal programme), he had to choose between continuing to work at Doñana and taking advantage of an opportunity to teach at the University of Granada, where he would be affiliated with our friends and collaborators Alberto Tinaut and Francisca Ruano. He opted to go to Granada, but he never truly left the Doñana Biological Station: He continued to share an office with Xim because, when he was not teaching in Granada, he was in Seville. He made the right choice because he enjoyed teaching, even if he sometimes complained that the students had a lot to learn because many had never been exposed to field conditions. We laughed when he grumbled that he took students to the mountains to teach them zoology and taxonomy, not survival skills. We could easily imagine Raphaël's expression as these poor "city dwellers" fought the wind while trying to stake their tents. He found joy in teaching, and it was even better if his classroom was the mountains. During that same general period (2008 - 2012), he would jet off to French Guiana to carry out research on ant diversity and ant-plant relationships with his friends and colleagues Jérôme Orivel and Alain Dejean.

He left his position in Granada early because, in 2012, he became a full professor at Polytech Tours (*École Polytechnique de l'Université de Tours*, EPU), an engineering graduate school where he was hired as an ecologist. Thanks to his professorship, he could once again be affiliated with the IRBI, where he became head of the research team focused on social evolution and responses to the environment (ESORE). Despite having moved back to France, he remained linked to Spain via the Ant Ecology Group (www.ant-ecology.eu), which was a collaborative team of French and Spanish researchers at the IRBI and Doñana. He was the soul of this unique international group, and we continued working together on different projects funded by Spanish or French research grants until his unexpected and far too early death.

From the first time he set foot in the Sierra Nevada of Spain, Raphaël was in love. He thought it was wondrous to have such variation in environmental conditions within such a short distance. Within a span of no more than 50 km, you travel from the beach to the mountain summits, from sea level to an elevation of 3000 m. During our last summers together (2015, 2016, and 2017), we stared at the ground counting ants (absurd beings, as a friend of Xim, Rafa Laffitte, once remarked in Doñana), with the feral children serving as haphazard research assistants. Despite sometimes feeling exhausted, we would always end the day happy, even the children.

The ant-team, which often also included the Catalan friends from the Autonomous University of Barcelona, Anselm Rodrigo and Xavier Arnan, worked together in many different places. There was the field work in Catalonia (with them and with the postdocs Jessica Pearce-Duvel, Mike Jowers, and Stéphane Caut), of course, but they also travelled to Morocco many times. Probably Raphaël got to know that wonderful country as well as his Mo-

roccan friend and collaborator Abdallah Dahbi. Raphaël and Xim also worked in Finland, where they spent a few intense weeks on Jöskar Island, in the Baltic Sea, with the friends Kari Vepsäläinen, Riitta Savolainen, Javi Retana, and Javi's wife, Dolors. Raphaël and Xim also explored nearly the entire Iberian Peninsula with Fernando Amor and Irene Villalta, looking for thermophilic ants. During driving, they could not listen to music because their 4×4 vehicles were too noisy. Instead, they passed the time talking about science, ants, and life. Raphaël loved to drive and to have conversations while driving. On one occasion, all passengers started nodding off after a morning of intense fieldwork and a large lunch. Raphaël was driving, as usual, and reacted to their dozing by slamming on the brake and honking the horn at the same time. They were startled awake, and he informed them, with his wry iconic smile: “Just reminding you, in case you had forgotten, that if I don't get to sleep, nobody gets to sleep.”

Raphael was a very broad thinker with ant-centred research interests. He was a myrmecologist, or an ant ecologist, who used his extensive experience with both laboratory and field approaches to answer ecological and evolutionary questions. It is very difficult to summarise the research path that he followed, but we would say that he began with ant behaviour, became interested in neurobiology and chemical communication, and then centred his attention on ant-plant interactions. He notably adopted a highly original perspective about the influence of chemicals on the relationships responsible for seed dispersal relationships. We spent many nights sampling not only ants, but also mice with his friends Ramón Soriguer and Paco Carro. He later became intrigued by intraspecific competition and carried out an excellent but very challenging experiment in Doñana National Park, where *Aphaenogaster senilis* colonies were excluded from a large number of plots. This work was the product of a collaboration with his friends Alain Lenoir and Thibaud Monnin. The results were published in 2010 in *Ecology*, and later Jessica Pearce-Duvet performed a similar experiment to analyse the effects of *Aphaenogaster senilis* on interspecific competition. Together, Raphaël and Xim also studied the queen pheromone in *Aphaenogaster senilis* with Camille Ruel; the personalities of different ant species with Olivier Blight; ant invasions with Elena Angulo and Olivier Blight; and the effects of wildfires on ant populations and communities with Anselm Rodrigo, Xavi Arnan, Javier Retana, Jessica Pearce-Duvet, Mike Jowers, Stéphane Caut, and his last PhD student, Jota (José Manuel Vidal-Cordero).

Omnipresent through the years was his work on *Cataglyphis* desert ants. The research in this realm perfectly illustrates Raphaël's dedication to collaboration building: He got funds from the LE STUDIUM Institute to hold a week-long meeting with fellow *Cataglyphis* specialists in Tours once every six months. The objective was to develop projects and write manuscripts focused on the study genus of choice: *Cataglyphis*. Abraham Hefetz, Paul Graham, Serge Aron, Claudie Doums, Thibaud Monnin, and Alain



Raphaël Boulay in the summer of 2016 counting the brood and workers from an *Aphaenogaster iberica* colony in Dúrcal (Granada, Spain) with the help of his daughter Anaïs (on the left) and Nuria Cerdá (on the right). (Photo credit: Xim Cerdá)

Lenoir were frequent participants; Rüdiger and Sibylle Wehner showed up one time as well. This *Cataglyphis* Le Studium group submitted a RISE project, which, unfortunately, did not receive funding, and published a review in *Annual Review of Entomology*. Raphaël was the heart and soul of these research meetings, not just on a scientific level but also on an interpersonal level. We believe that everyone who worked with him, all the researchers that we have listed here, became Raphaël's friends. At Doñana, he empathised deeply with young researchers (i.e., PhD students or postdocs), even those who were not a part of his research team. If he noticed that someone was having a hard time, he would spend time with him or her. He would share a joke, a few words of encouragement, or some advice; he would extend a comforting gesture or give a confidence-boosting compliment. There were moments when Xim turned to him because he was at a complete loss for dealing with certain colleagues. He addressed the problems with perfect diplomacy, reopened the lines of communication, and made any remaining issues vanish. His empathy, patience, and understanding were a remarkable gift.

We want to remember Raphaël fondly but not sadly because that is what he would have preferred. We are sure he would have liked for us to honour his memory with some beers, with laughter, with well-earned fatigue after a productive day of field work, with moments spent in beautiful landscapes. And this is what we are doing. Raphaël did not particularly like Spanish music. He preferred Frank Zappa or the Rolling Stones, but he was polite and thus frequently endured the musical preferences of his field assistants, Ana Carvajal and Isabel Luque. As we recall our happy trips together in the long, hard hours of field work without him, one song in particular has been playing in our head: “Sevillanas del Adiós” by Manuel Garrido. Its oft-repeated refrain is this: “Algo se muere en el alma, cuando un amigo se va / Y va dejando una huella que no se puede borrar [Something in the soul dies when a friend goes away / And it leaves a trace that cannot be erased].” Luis Sepúlveda once wrote “as long as we name them and

tell their stories, our dead never die” (*La Lámpara de Aladino*). We sincerely hope so because it means that Raphaël will remain with us, as long as he lives on in the hearts and minds of the Ant Ecology team, his friends, and his family. Raphaël leaves behind his wife, Irene Villalta, and their young daughter, Anaïs. Irene and Raphaël’s collaborators will do their best to honour his memory by publishing all the manuscripts that he left unfinished.

A final request

If you can, please donate bone marrow (<https://www.ebmt.org/information-patients-donors>). Raphaël might still be alive if he had found a more compatible donor.

Acknowledgements

Florian Steiner asked Xim to write this obituary, which is probably the most difficult text that we have written in our lives. We deeply appreciate his patience as an editor and Herbert Zettel for helping to revise the text. Thanks also to Alain Lenoir for providing certain details about Raphaël’s background.

List of publications

(To download pdf files, visit <https://www.ant-ecology.eu/publications/>)

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