

Julie Morand-Ferron retrospective (1977–2022) for FACETS

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In February 2022, Julie Morand-Ferron left us prematurely at the age of 44. Julie was not only an accomplished artist and a vibrant communicator, she was also a rising star in the field of animal behaviour, and recognized internationally as an expert in animal cognition and cognitive ecology. The goal of her career was to understand how cognition works and evolves in natural environments. From birds to crickets, and from lab to fieldwork, she studied why cognition varies among species and individuals, in both the proximate and ultimate sense. She was also a wonderful colleague, friend, and inspiration for all people around her. Although still at a relatively early stage of her career, Julie had an exceptional impact on the scientific community and was loved by many. Here we summarize her scientific journey.

Photo by Chloé Montreuil-Spencer.



Education and first steps in science

Julie was a native French speaker and spent most of her life in Quebec, Canada. In 1998, she started her career as

an undergrad at Laval University, under the supervision of Prof. Jeremy McNeil. She was the kind of student who left their mark, impressive not only for her academic brilliance but also for who she was as an individual. When Julie joined Prof. McNeil's lab, he was interested in which factors associated with the male spermatophore affect the duration of the post-mating refractory period in polyandrous lepidopterans. Was it just the size of the spermatophore affecting stretch receptors, the presence of sperm, and/or the accessory gland secretions? To answer these questions, Julie took on the challenge of designing an elegant but difficult experiment that most people would have abandoned after the first failed attempt. But Julie's tenacity won out; she found how to remove the germinal testicles from late instar larvae and she was able to show that the presence of sperm was not the only factor affecting females' production of pheromones. She impressed everyone with her intellect, curiosity, and dedication as a scientist, as well as her empathy as a caring individual who was cheerful and always willing to lend a hand.

After initially working on invertebrates, Julie chose another route. She moved to McGill University in 2001 to start a Masters degree, soon upgraded to a PhD, with Prof. Louis Lefebvre on foraging innovations and kleptoparasitism in birds. Using field as well as aviary experiments, she investigated the functional ecology and consequences of innovative food "dunking" in water by Carib grackles (*Quiscalus lugubris*) in Barbados. Julie discovered that food dunking was a proto-tool-like food-processing technique to soften dry foods for easier ingestion that was expressed strategically, depending on relative costs and benefits (Morand-Ferron et al. 2004). Noticing that dunked items were often stolen by grackles, Julie did a first field test of the producer-scrounger game. Dunking behaviour was expressed rarely when water was far away and food was scarce, as the latter increased the risk of competition and food theft (or "kleptoparasitism"; Morand-Ferron and Lefebvre 2007). Julie then increased the taxonomic scope of her studies by conducting a comparative study to investigate the evolution of kleptoparasitism in birds. With the help of Dr. Daniel Sol, she acquired the quan-

titative skills to conduct multivariate analyses while controlling for common ancestry and showed not only that bird families with larger relative brain sizes were more likely to engage in food theft, but also that kleptoparasites had larger relative brains than the heterospecifics they stole food from (Morand-Ferron et al. 2007b). She won numerous grants and awards during her PhD, including NSERC postgraduate scholarships and the *Arthur Wiley Memorial Fellowship* at McGill. Julie also had a huge influence as the “scientific big sister” of Dr. Sarah Overington and Dr. Neeltje Boogert, who were lucky enough to share the office with Julie at the start of their PhDs. Julie helped Sarah in her studies on the effect of social context on innovation in Carib grackles (Overington et al. 2009a) and a comparative analysis showing that technical foraging innovations drive the link between innovativeness and residual brain size in birds (Overington et al. 2009b). Julie was a major inspiration and mentor to Neeltje, gracefully hosting her in Oxford and Ottawa, and contributing to their joint introduction to the recent special issue of the *Philosophical Transactions of the Royal Society B: Biological Sciences* on “Causes and consequences of individual differences in cognitive abilities” (Boogert et al. 2018).

Career and recognition

In 2007, Julie began her first postdoc at the Université du Québec à Montréal (UQAM) with Prof. Luc-Alain Giraldeau. Fascinated by the complex interactions of birds foraging in groups (Morand-Ferron et al. 2007a), she took the field of learning in the context of the producer-scrounger game to a new level. Using leftover operant devices lying idle around the lab, Julie rigged an apparatus that could be used as food patches in an ideal free foraging setting and started collecting data on subjects within groups responding individually to reward rates. With colleagues in the Giraldeau lab, Julie demonstrated that learning rather than fixed rules of thumb were responsible for individual changes in strategy use in producer-scrounger games (Morand-Ferron and Giraldeau 2010). Her clever experimental approach also demonstrated that the identity of flockmates influenced an individual’s use learning (Morand-Ferron et al. 2011a). She also shows that the value of sampling to adjust one’s tactic use in a frequency-dependent game can be positive in one game (PS game) and negative in another (Ideal Free patch choice (Morand-Ferron et al. 2010). These results proved important in showing that the value of learning is not universally positive and may depend on a combination of personality of self and social companions. These numerous results had a big impact on the field.

Although Julie did much of her work in the lab, she was especially keen to understand the functional significance of cognition in natural populations. Her prestigious Natural Sciences and Engineering Research Council (NSERC) fellowship took her to Oxford University in 2009, where she joined Prof. John Quinn to work on innovative problem-solving in a natural population of great tits (*Parus major*). She produced two of her most influential empirical papers showing how problem-solving is linked to social, individual, and ecological factors using an experimental approach in the wild (Morand-Ferron

and Quinn 2011; Morand-Ferron et al. 2011b). Around this time, she also wrote some key review papers on the evolutionary ecology of cognition in wild populations (Morand-Ferron et al. 2016).

In 2012, Julie returned to Canada to take up an Associate Professor position at the University of Ottawa, where she achieved success after success. In 2016, she gained an Early Researcher Award by the Government of Ontario. She then became the University Research Chair in Cognitive Ecology in 2017 and began to work on a series of new systems, including crickets and mountain chickadees. In 2019, she was awarded the Young Researcher of the Year Award in the Faculty of Sciences at the University of Ottawa and a Discovery Accelerator Supplement from NSERC in recognition of the originality and innovation of her research program and her potential to become an international leader in her field. In 2021, Julie was nominated to the College of the Royal Society of Canada and, in 2022, she won an award for the best paper of the year in Learning & Behavior by the Psychonomic Society (Morand-Ferron et al. 2022). Throughout this period, she not only opened her own lab but strengthened and developed multiple collaborations all over the world.

Julie shared her research beyond the scientific community through interviews on national radio and TV in both French and English (*Les années lumières*, Radio-Canada, and *Quirks & Quarks* on CBC) and as a monthly contributor to *Moteur de Recherche*, a radio show that answers listener questions about science. She was also the focus of a compelling “Field report” podcast for the British Ecological Society (2017) (*Field Reports: Julie Morand-Ferron* 2017).

The social researcher

Julie embraced collaboration and she was sought after by many for a variety of good reasons. Perhaps first and foremost, she had the working knowledge that helped ensure experiments were designed correctly to advance the field in impactful ways. One of the greatest examples might be her input into the now famous studies on innovation and cultural transmission in a wild population of great tits at Wytham Wood (Cole et al. 2012; Aplin et al. 2015). Lucy Aplin, now one of the most successful researchers in cognition of her generation, credits Julie with being a big influence during her PhD. Julie was also one of the first to develop an automated device to measure cognition in the wild when she designed, built, and tested an operant learning device among wild great tits (Morand-Ferron et al. 2015). This led to a series of collaborations on similar questions in other populations (Hermer et al. 2018, 2021) and to the development of new devices to explore the causes and consequences of variation in cognition in the wild (Cauchoix et al. 2022).

The second is her positivity and ability to provide constructive criticism. Any researcher who worked with Julie, or who just spoke with her in any capacity, was always left feeling their own work had value. Julie’s passion for any of her many fields of interest could have a major im-

pact on others' early attempts and motivation to explore them.

Finally, she was not afraid of exploring new biological models, methods, and fields such as physiology in crickets (Careau et al. 2015), meta-analyses (Cauchoix et al. 2015; Poirier et al. 2020), and even neurorobotics (Cyr, Morand-Ferron and Thériault 2021).

Many continued to collaborate with Julie for years after she left their shared environment, and she will be missed enormously as a collaborator for many years to come.

In addition to science, Julie had a parallel career in music. With her musical and life partner Eric Trottier, she sang and wrote for the electro and synth-pop bands 011 and Violence. 011 won the MIMI Best Electronic Group Award in 2006 and was invited to play at the Osheaga and Francofolies festivals in Montreal. Violence had an international fan base, and when Julie travelled to give scientific talks, she and Eric gave shows in places like Tokyo, Berlin, and New York. Julie's ethereal voice can be heard on several songs available on Bandcamp (violence.bandcamp.com/track/illusions-vives) and elsewhere (https://www.hartzine.com/violence_dernier_cri/).

Conclusion

Julie was generating a deep understanding of how cognition evolves in the wild, one step at a time. While her studies and communications often led to new and constructive perspectives, they brought people together and consolidated ideas even more. We will miss her humorous presentations, kind and constructive perspective on every project, her sparkling presence and wisdom in mentoring others, and her communicative passion for science. She was a superb scientist and a wonderful human being. Even in the short time she had, she made a huge difference and inspired the next generation of scientists.

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