The introduction of alien species into new habitats is one of the main economic and ecological problems related to environmental change, which produces the displacement of biodiversity and the contact with exotic diseases. None of the introductions changed evolution as much as the introduction of ants. The Argentine ant (*Linepithema humile*) underwent a new and unique evolutionary phenomenon when they were introduced in new areas: they lost the competition between colonies. This produced the cooperation between vast nets of connected colonies (6000 km in South Europe), the supercolonies. The adaptation of invasive species is frequently favoured by their behavioural plasticity and cognition, it means, how individuals adapt their behavioural skills to the new environmental conditions. These skills are costly because involve the investment of resources to the brain instead to other traits as reproduction, immune system or survivorship. However, it was proposed that behavioural plasticity could be based on social information rather than in individual traits. This means that colonies may reduce cost of behavioural skills by improving the communication among its members. Unravelling whether the source of plasticity originates at the individual (brain-cognition) or collective (social information transmission) level should be a priority for understanding the invasive potential in social insects. Invasiveness could also be affected by predicted environmental changes, i.e. species would have to adapt to new areas introduced but also to new changes in those areas. A total of 87 viruses have been detected in ants, some of which can be transmitted to other species like honeybees. Both behaviour and infection potential are conditioned by temperature. Disentangle how virus infection and temperature fluctuations affect brain-behavioural plasticity would help to understand how supercolonies invasiveness will be affected in the near future.

The main trait sharing all ant supercolonies resides in their translocation, adaptation, and invasiveness. This suggest that the new cooperation among eusocial colonies, the organization system that has gone beyond the limits known so far, constitutes a successful evolutionary process under extreme environmental changes. Current environmental changes lead to the extinction of native species, but the amplification of the success of ant supercolonies. Understanding how supercolony deal with new problems and pressures seems to represent the central key for deciphering its evolutionary emergence and invasiveness. Therefore, we propose to analyse whether (1) individual plasticity and cognition depends on brain complexity, which would evidence the trade-off in individual investment in individuals belonging to supercolonies; (2) plasticity depends on individual cognition or social communication in supercolonies; and (3) the effect of future environmental stressors as temperature fluctuations and virus infection modify the individual cognition in invasive and native ant species. We expect (1) individuals with high developed brain structures showing higher behavioural plasticity and succeed more times and faster the behavioural tests; (2) Argentine ants showing lower efficiency in solving new problems at the individual level than native ant species, but the opposite when the problem could be solved by cooperation among individuals; (3) worse outcome in individual problem-solving, observed as lower success in behavioural tests and disruption of correlation between behaviours, in individuals exposed to fluctuant temperatures and infected to virus; (4) the synergic effects of temperature and virus infection; (5) native species showing lower success in behavioural tests and greater alteration on the correlation of behavioural when exposed to fluctuating temperatures and virus infection than individuals of the invasive species.