Making Sense of Brain and Behavioural Lateralization

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Abstract

Session: From Neurons to Knowledge (Daniel Brooks, Elisa Frasnelli, Paola Hernandez Chavez, Isabella Sarto-Jackson, Katherina Zakravsky) Traditionally, only humans were thought to have strong left-right asymmetries in the brain and at the behavioural level, but recent studies have revealed that most vertebrates and invertebrates are indeed lateralized. Further, it has become apparent that two patterns of lateralization exist across species. In "individual-level" lateralizations an equal number of left- and right-biased individuals coexist in the species, while in "population-level" lateralizations a majority of individuals is right- or left-biased. The latter is the case for humans; a good example is handedness. While individual-level lateralization may have evolved because it increases individual brain efficiency, population-level lateralization is unrelated to individual brain efficiency, and remained unexplained for many years. Recently, it has been suggested that the alignment of lateralization at the population level may have evolved as an evolutionary stable strategy when individually-asymmetrical organisms must coordinate their behaviour with that of other asymmetrical organisms. Game-theoretical models developing this idea and considering group-living individuals engaging in intraspecific and interspecific interactions suggest that population-level lateralization is more likely to evolve in social than in non-social species. I evaluate this new hypothesis, and provide supporting empirical data by comparing different insect species that show different levels of sociality.

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