Decision-making by ants: Rational groups of irrational individuals?

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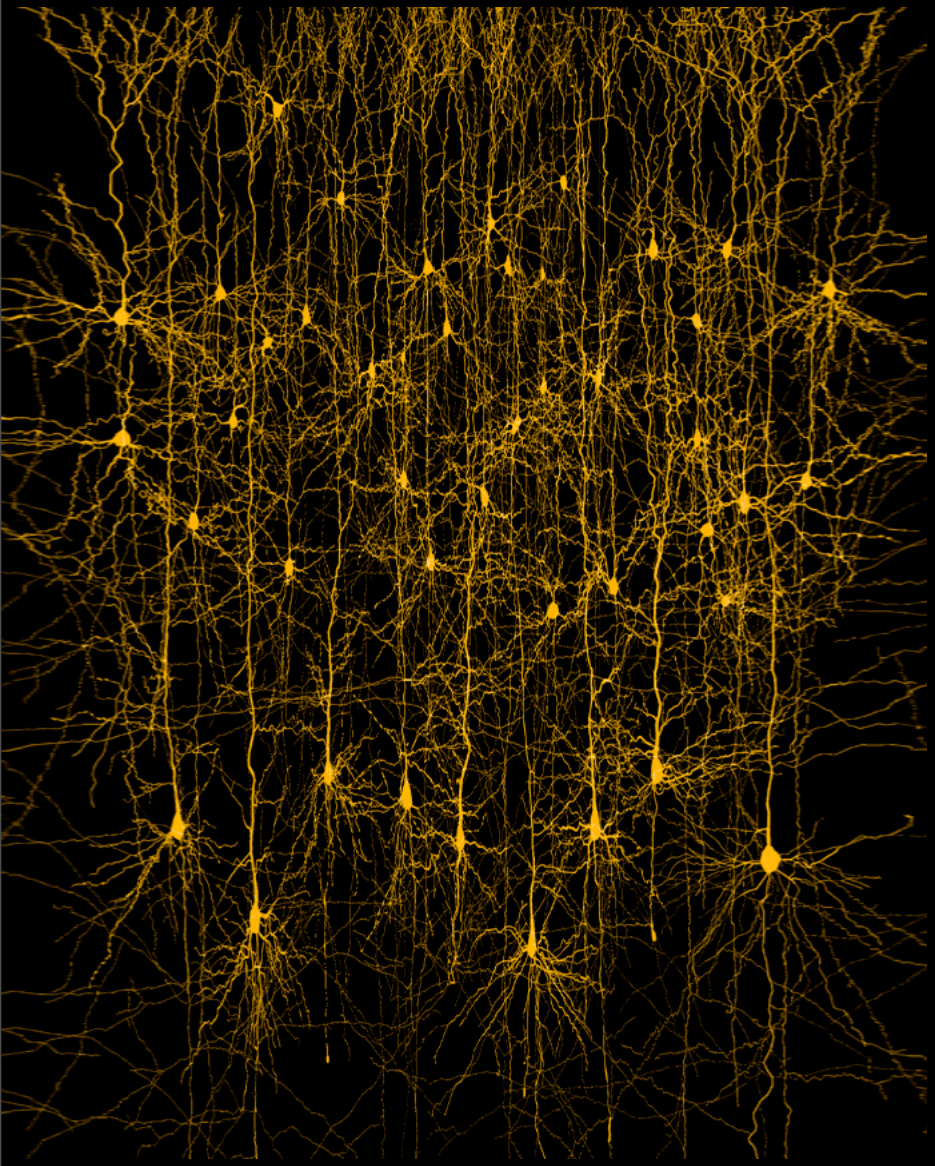
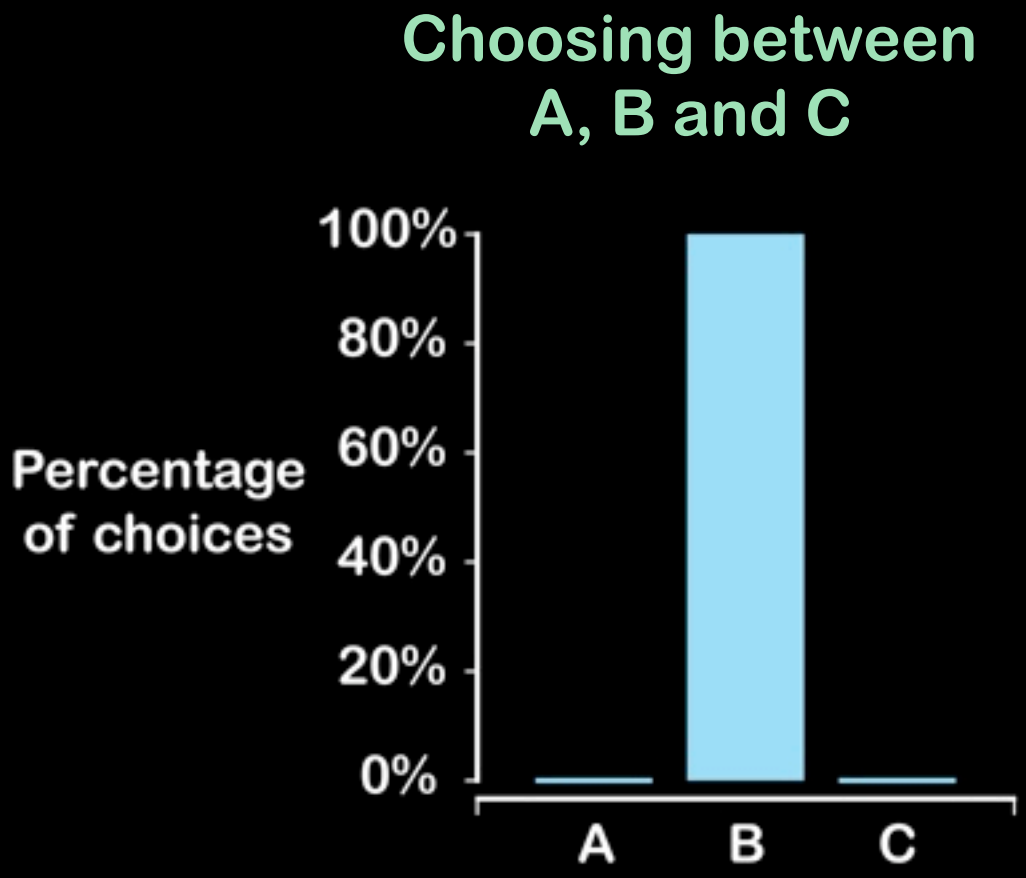


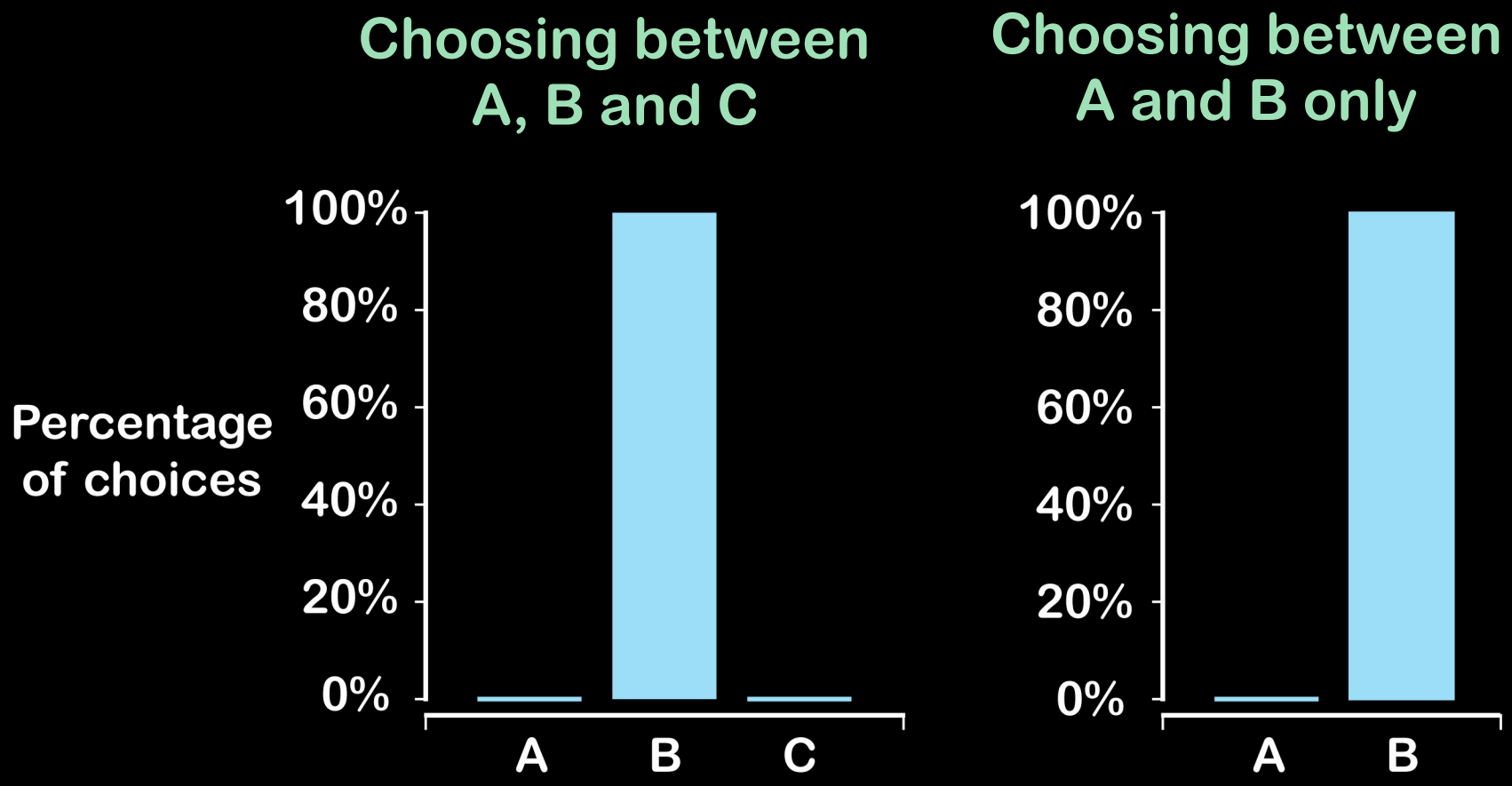
Blue Brain Project

B. Hölldobler

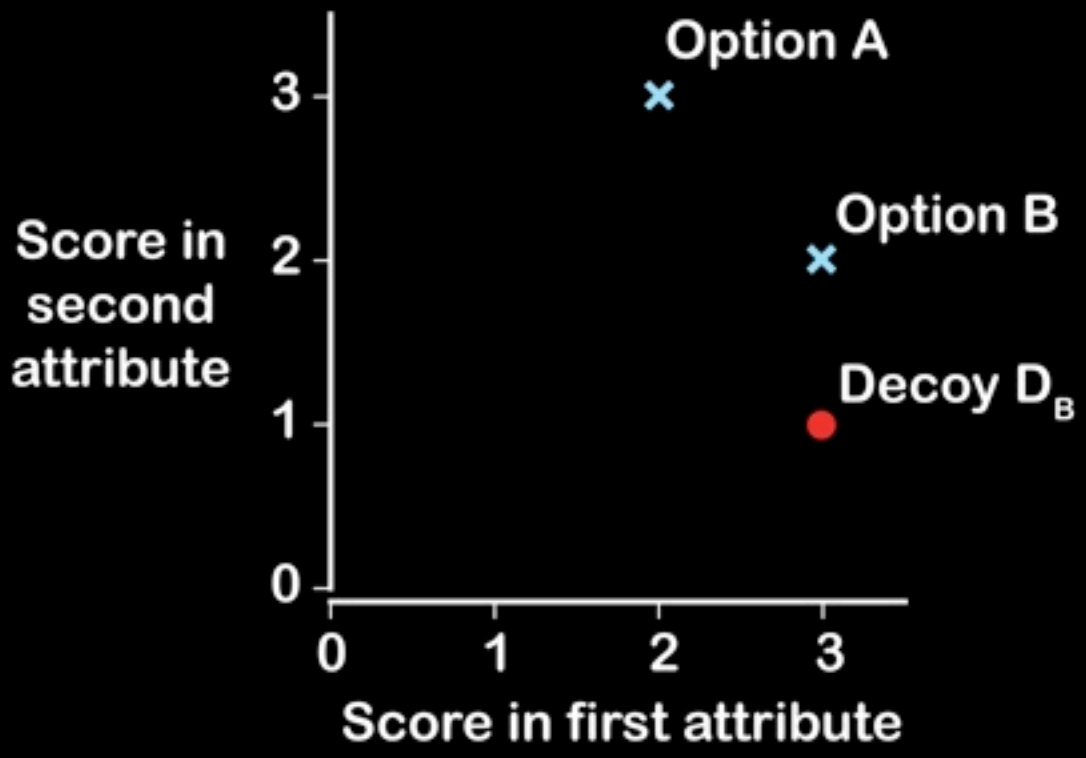
Independence of Irrelevant Alternatives (IIA)



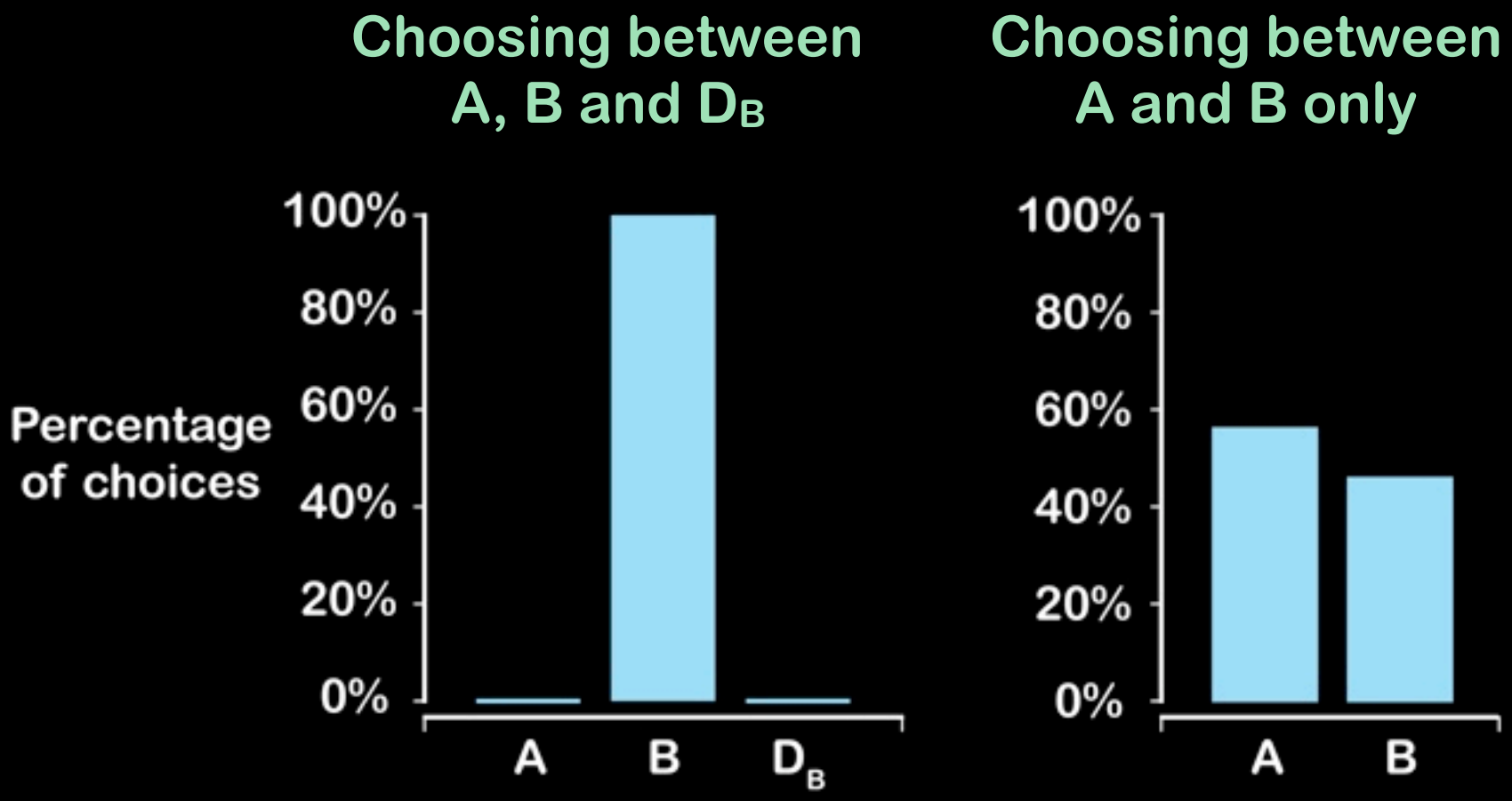
Under IIA, removing decoy does not change preference



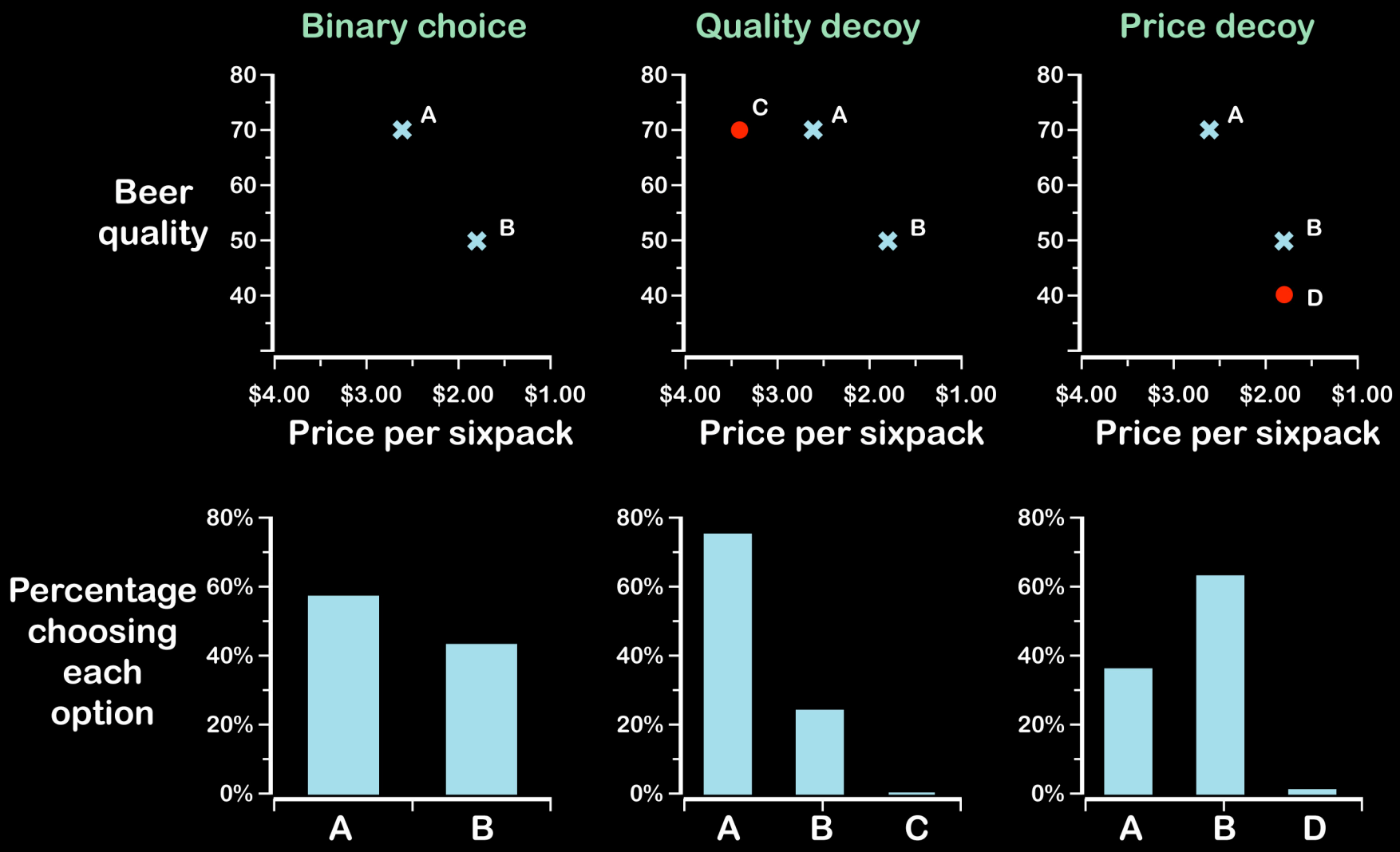
IIA is often violated in presence of an asymmetrically dominated decoy



Asymmetric dominance causes violation of IIA



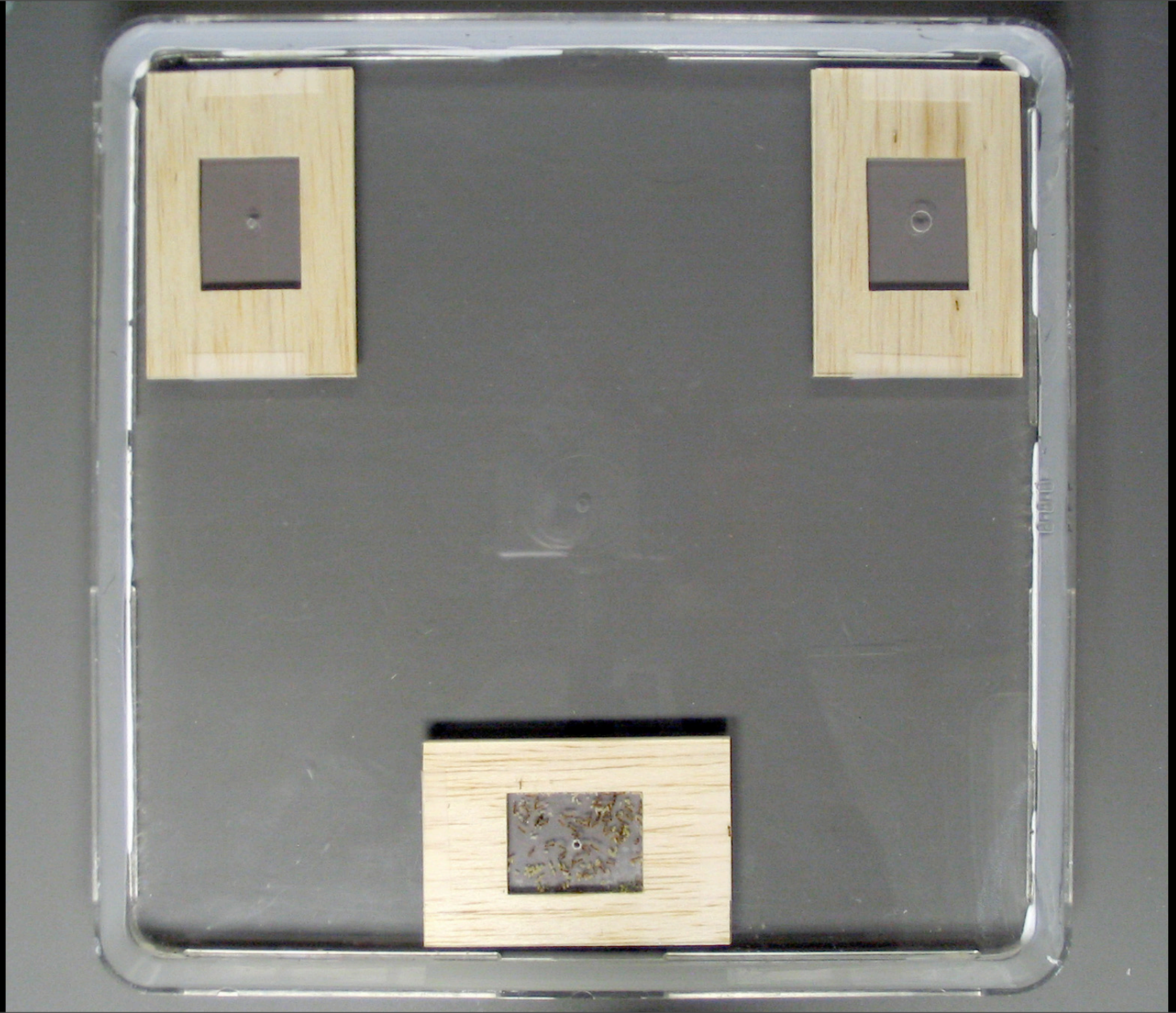
Irrational choice by humans

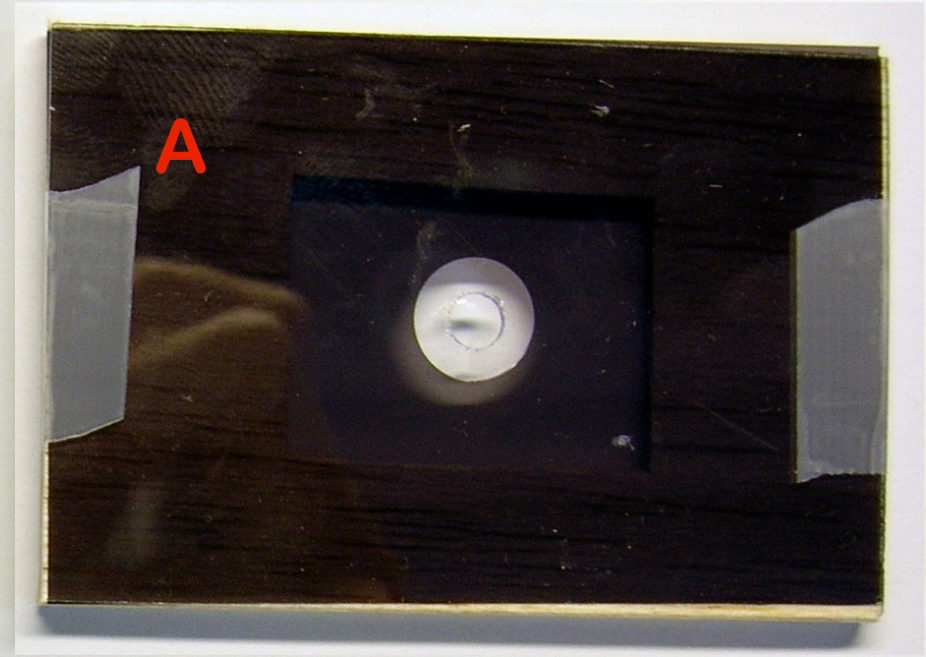


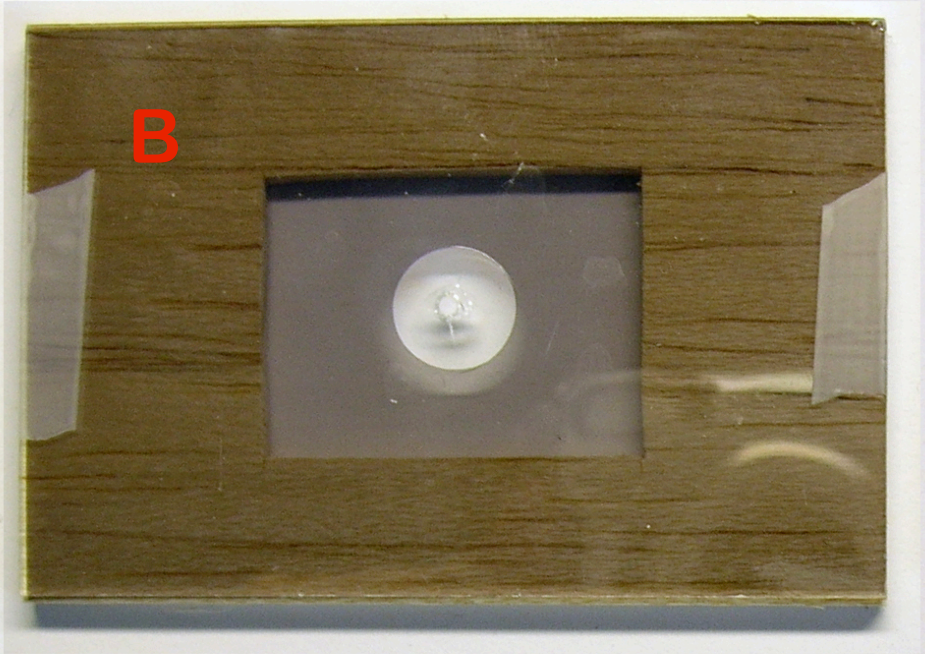
Huber, Payne & Puto, 1982

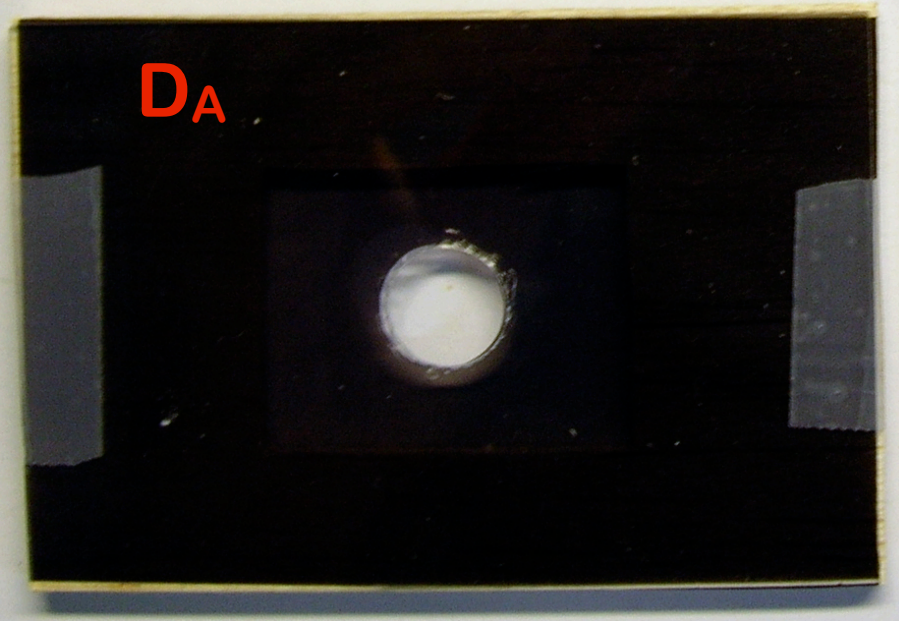
Other animals also violate rationality

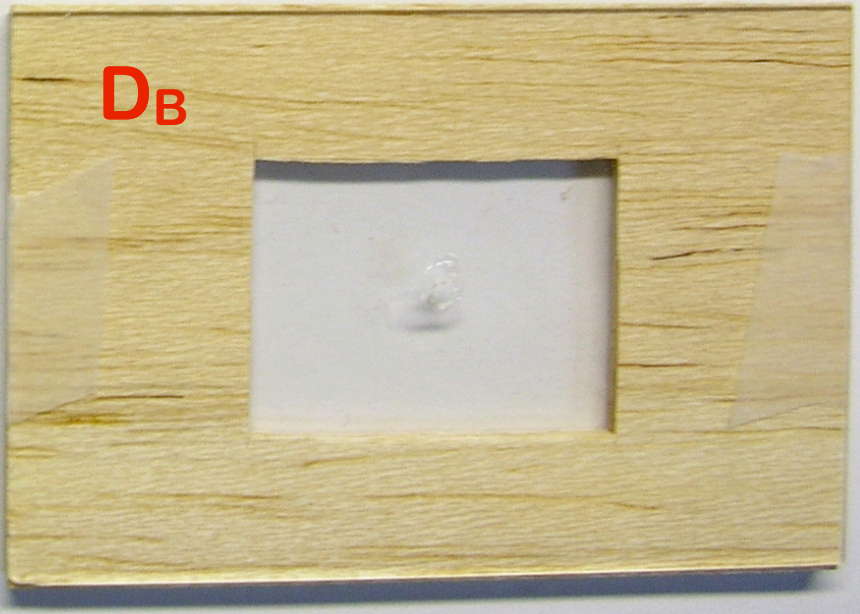
Are colonies rational?



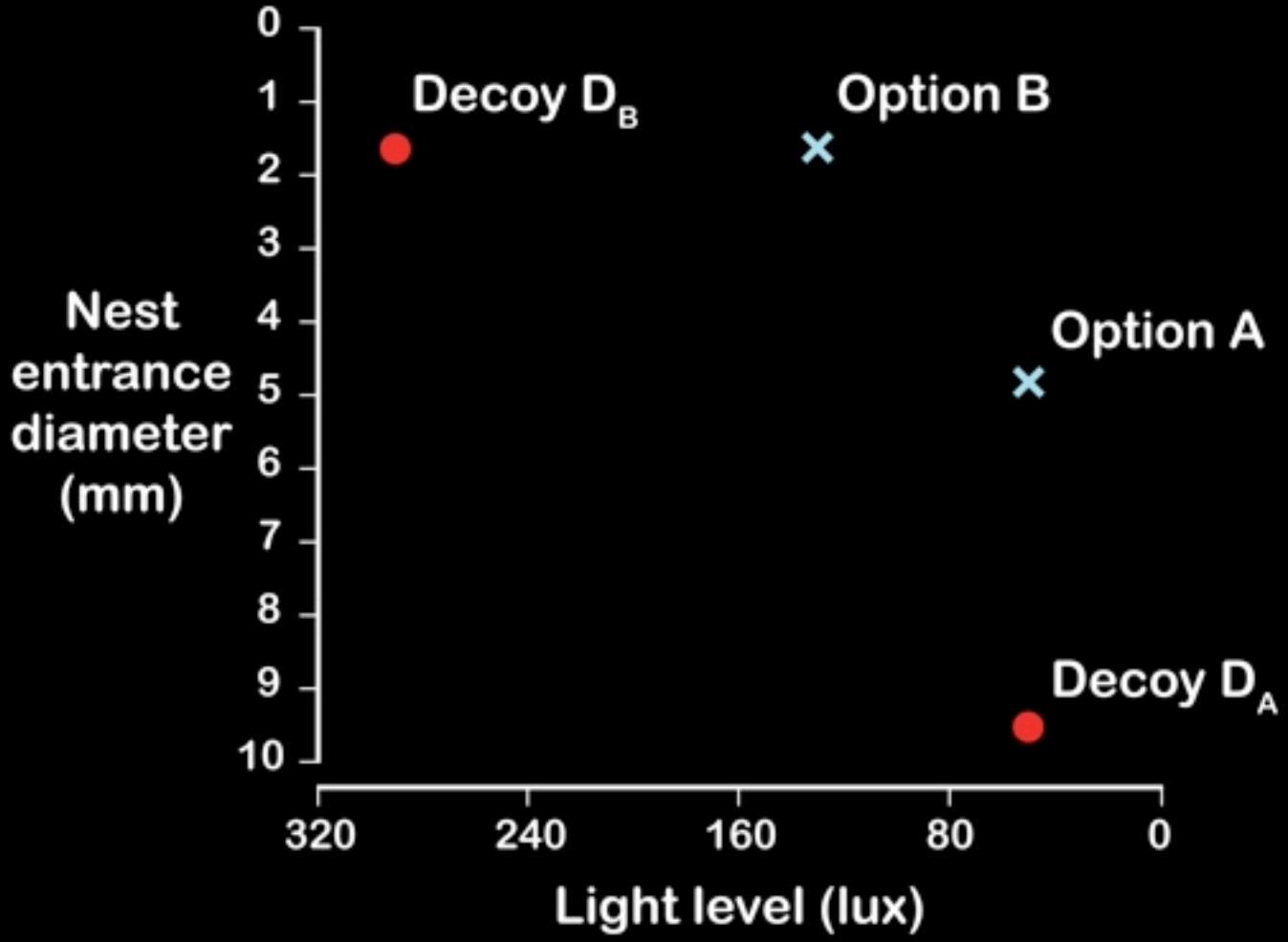

A


B

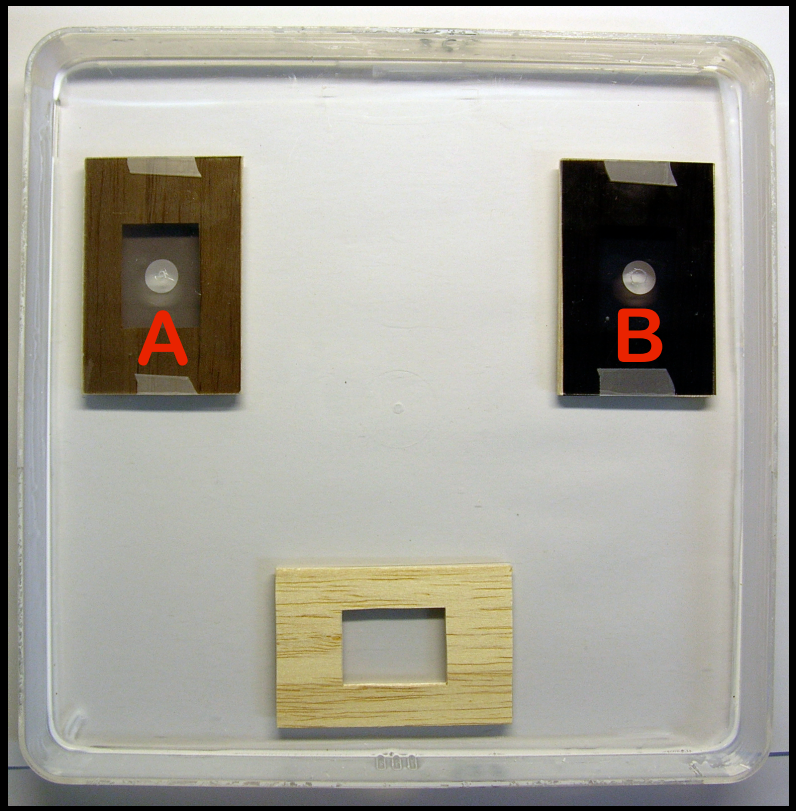

DA


DB

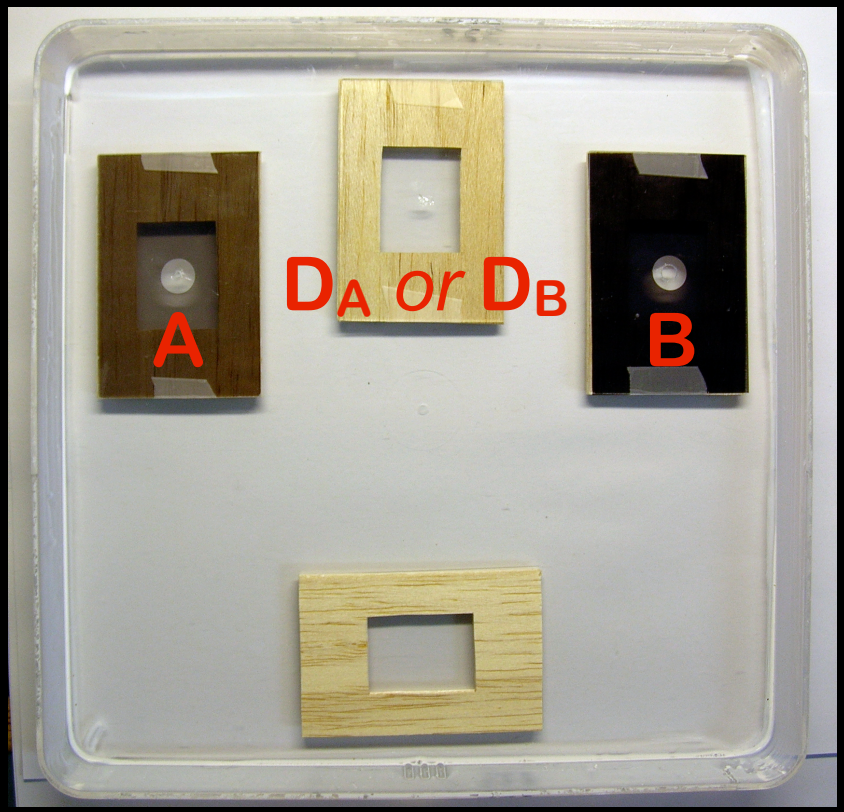
Asymmetrically dominated decoy nests



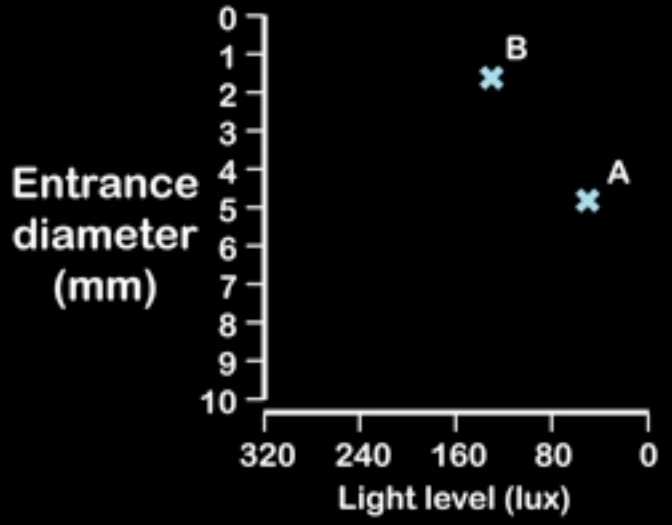
Binary choice

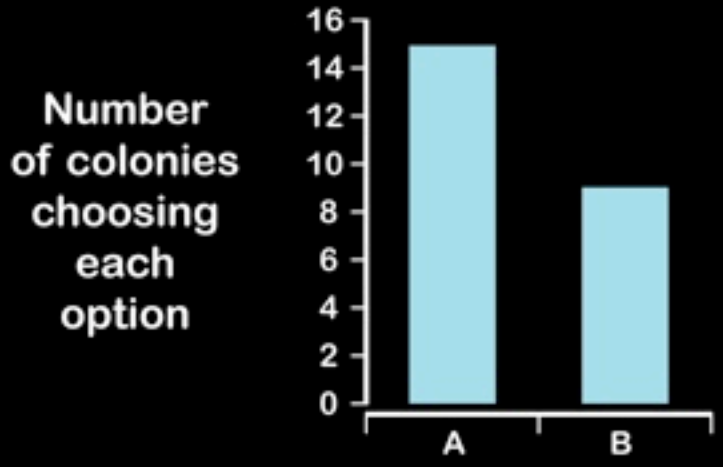


Trinary choice

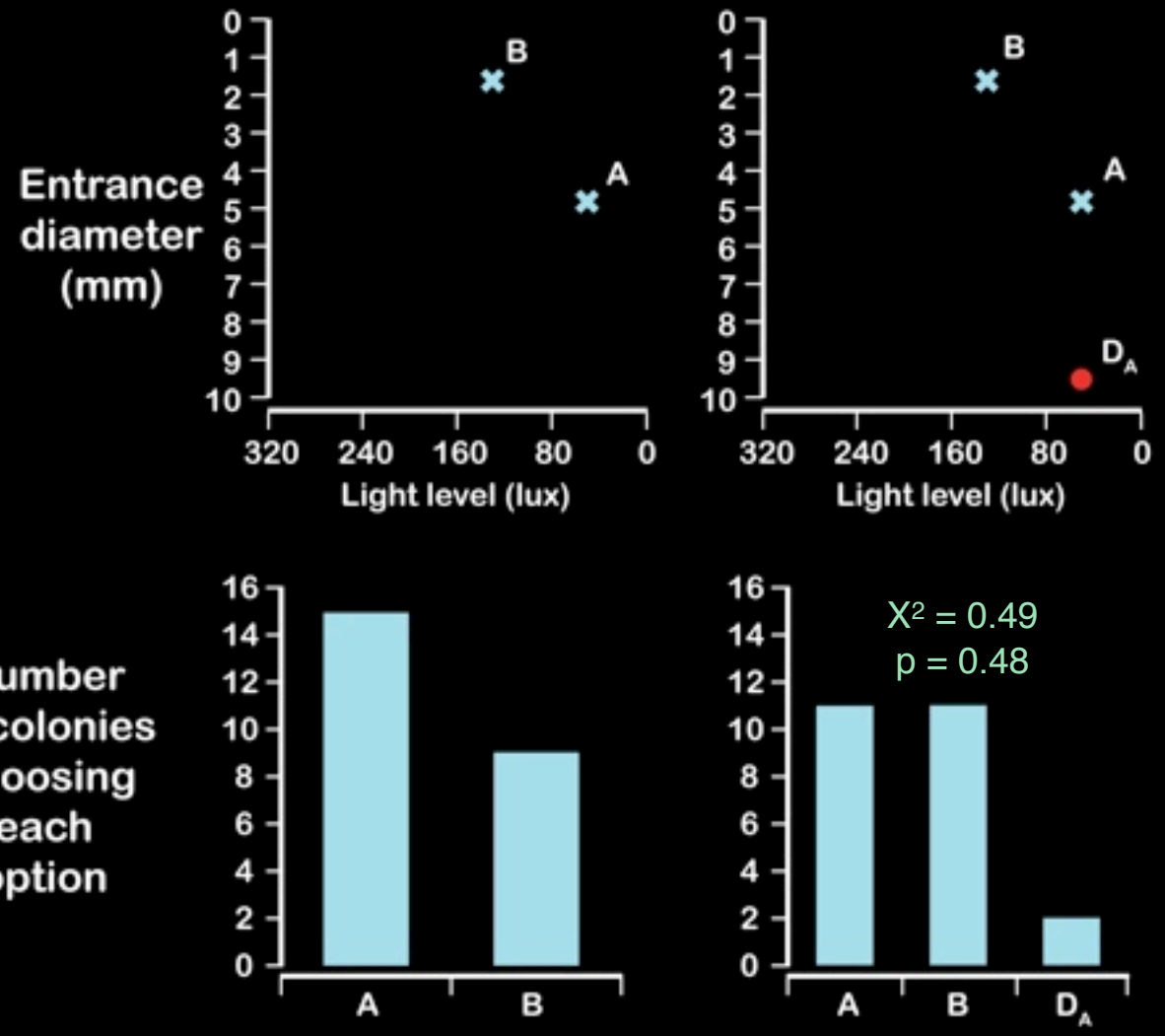


Colonies are ambivalent about A and B

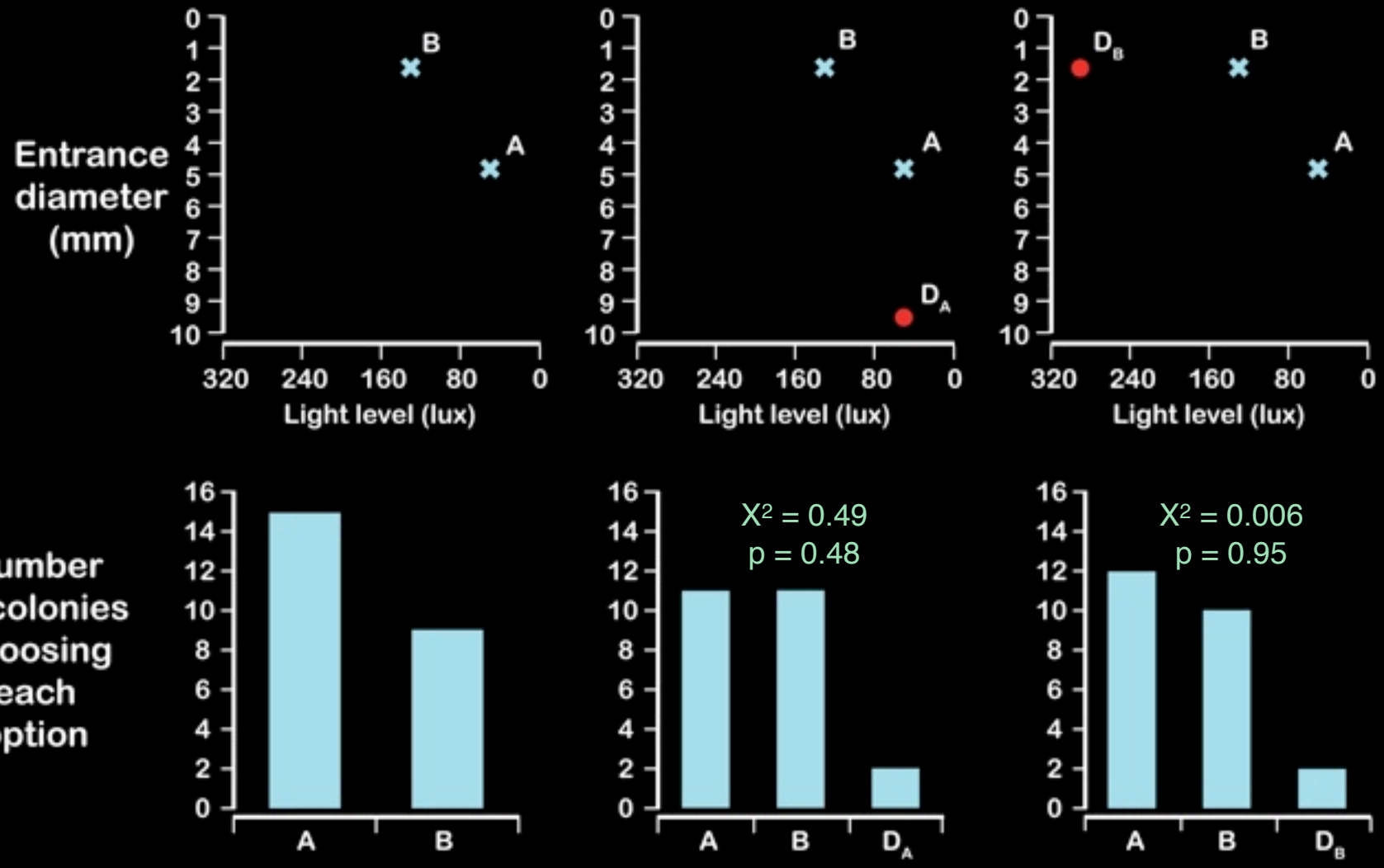




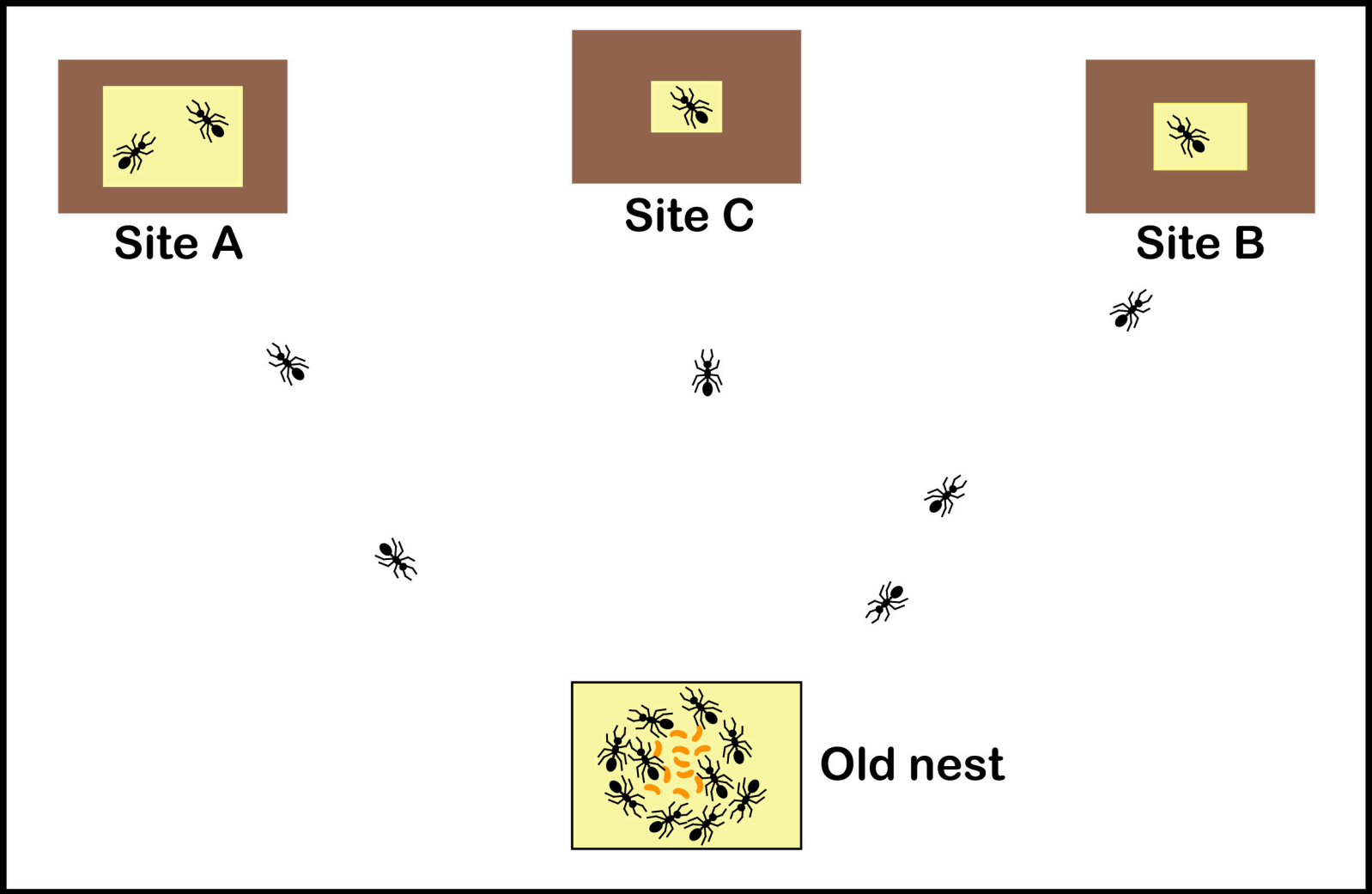
Decoy D_A does not enhance preference for A



Neither decoy enhances dominant option

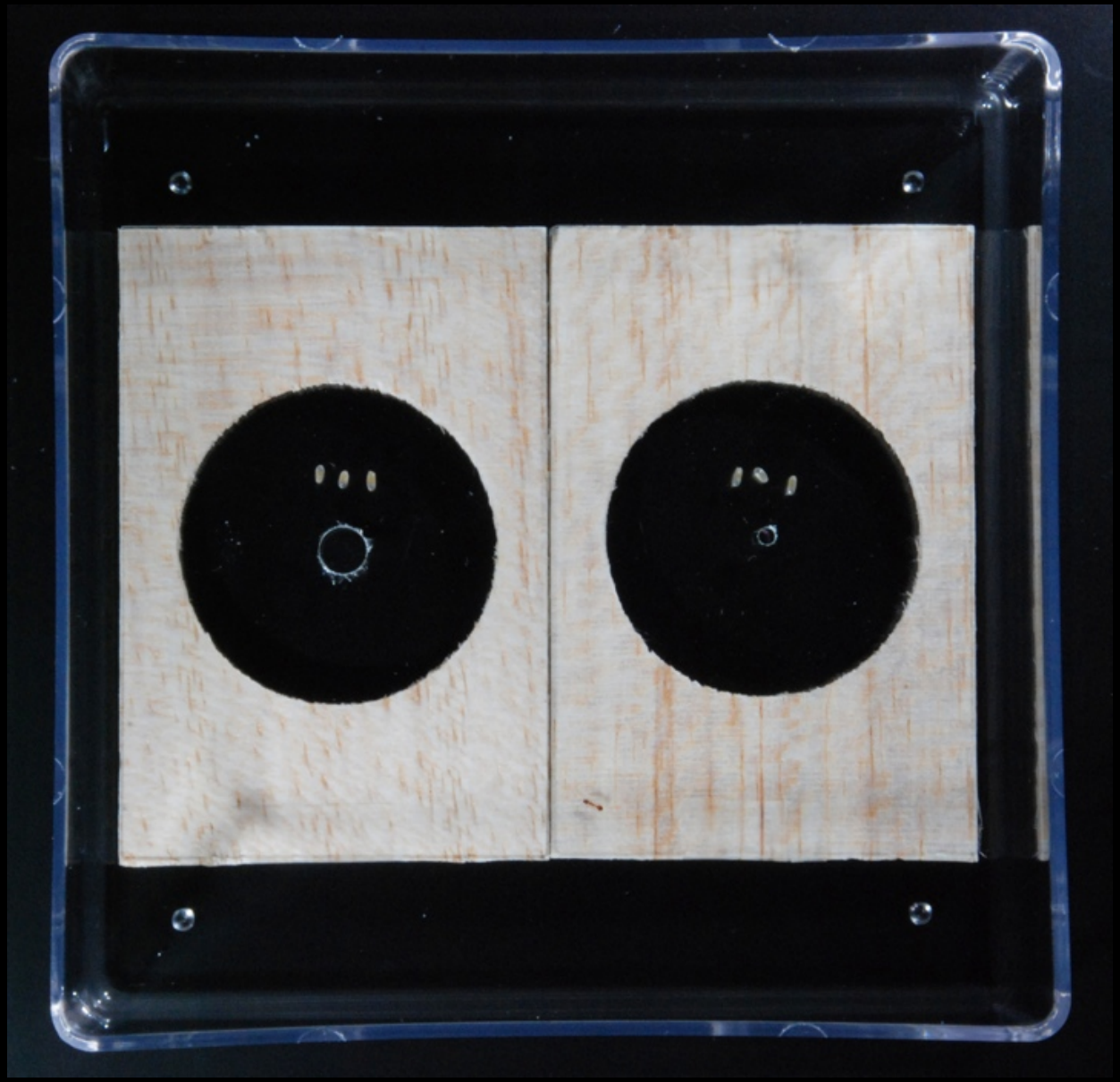


Distributed decision-making prevents irrationality?

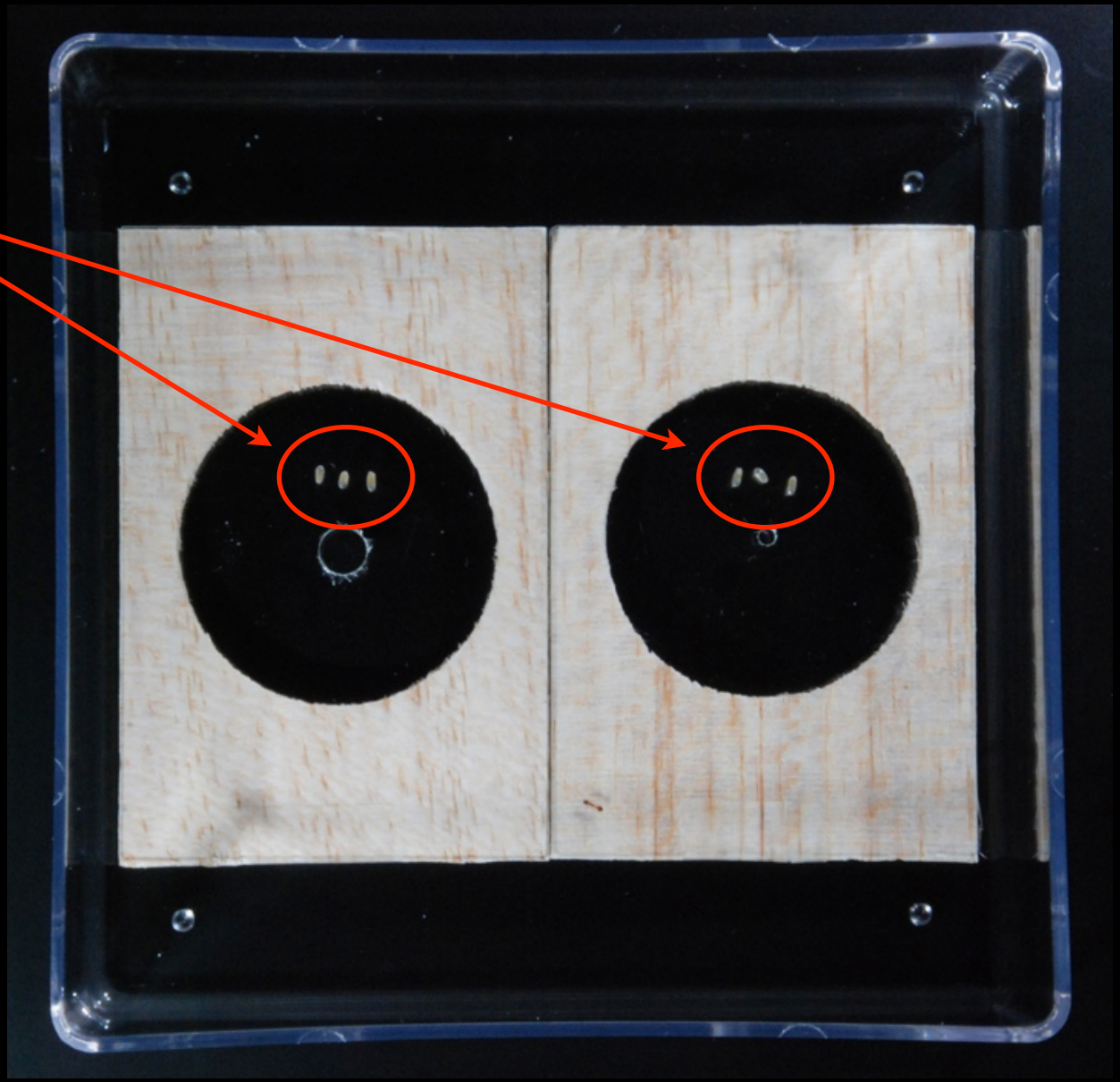


What about individual ants?

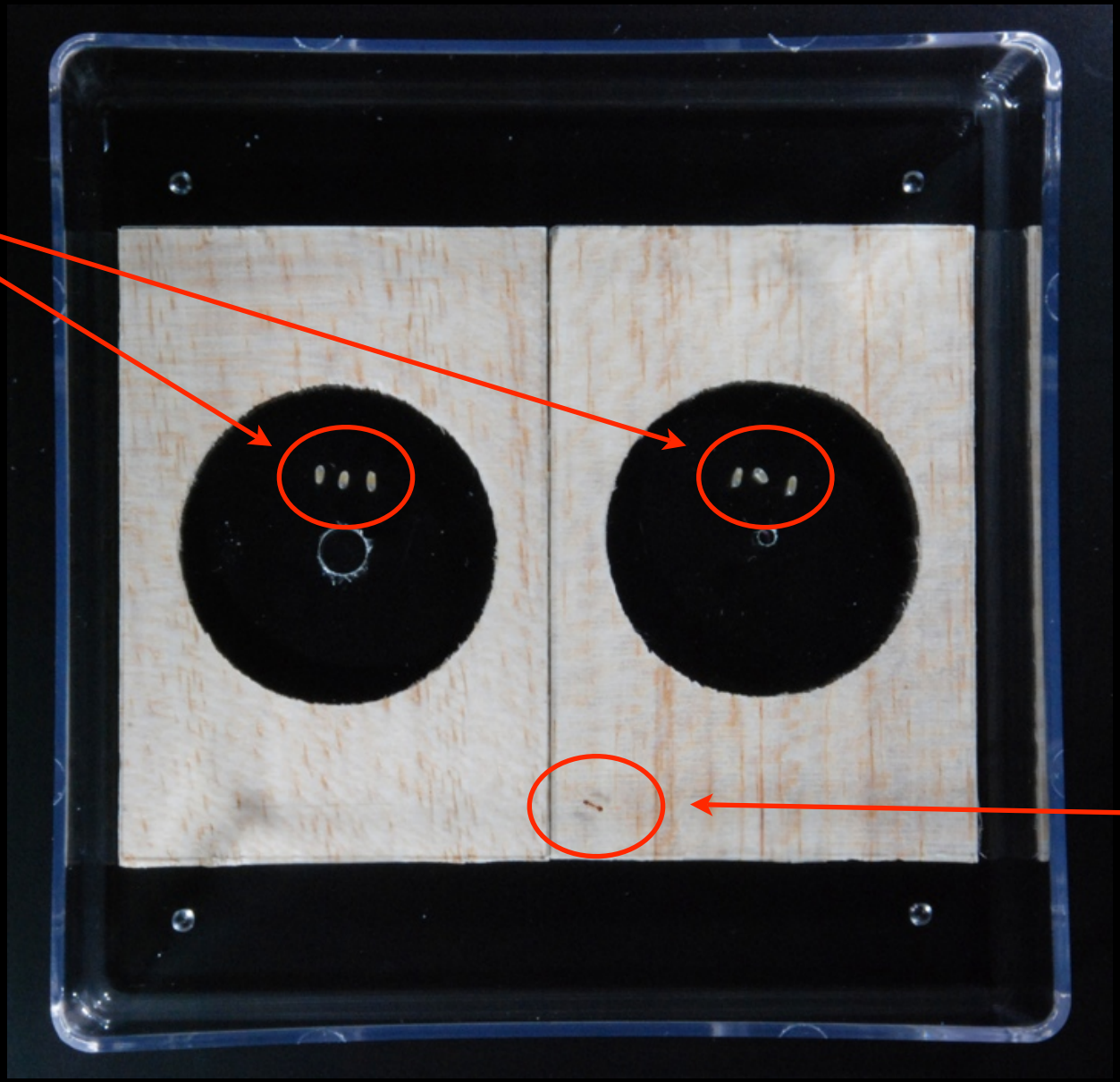
Setup for determining a lone ant's preference



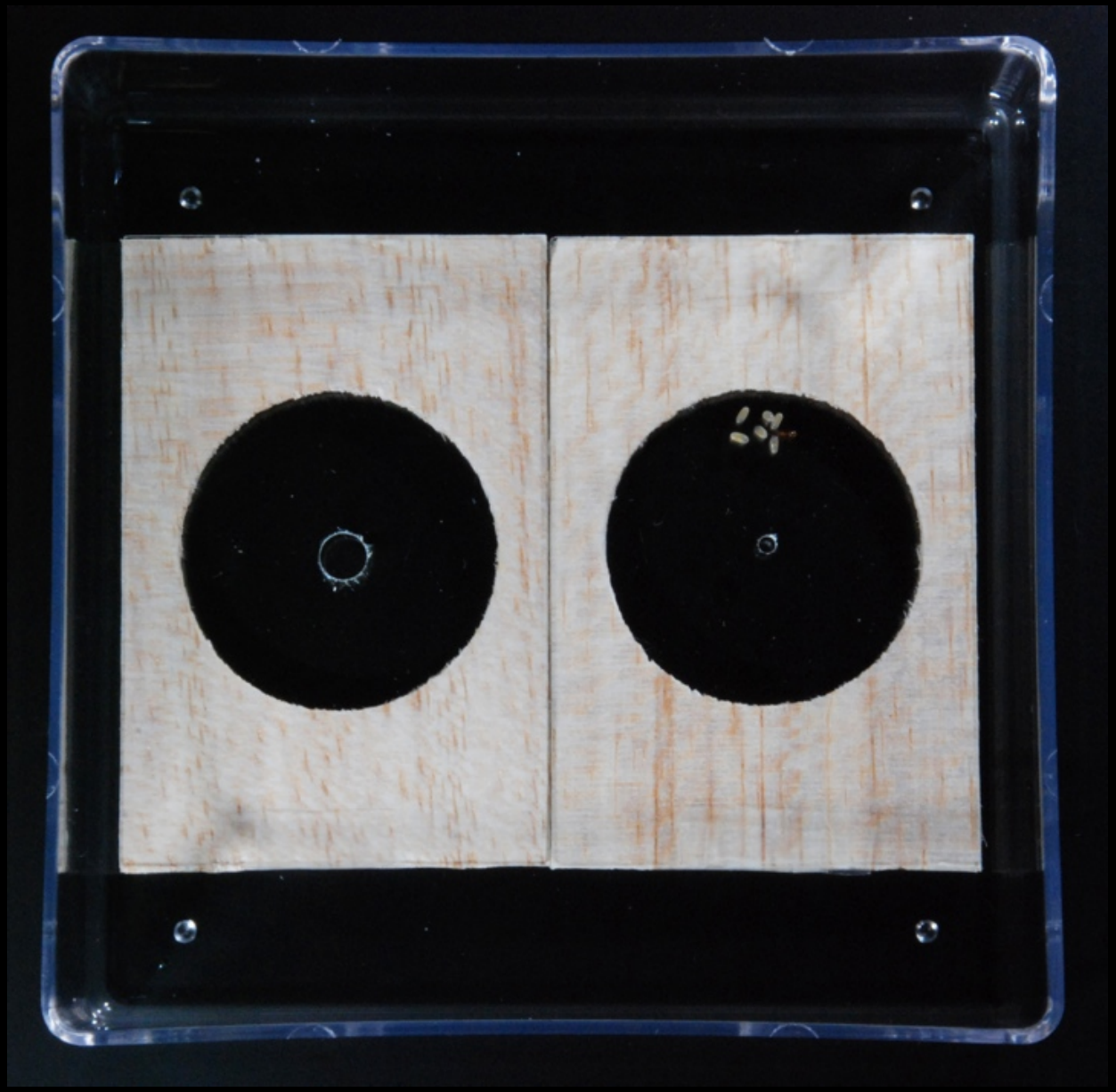
Setup for determining a lone ant's preference



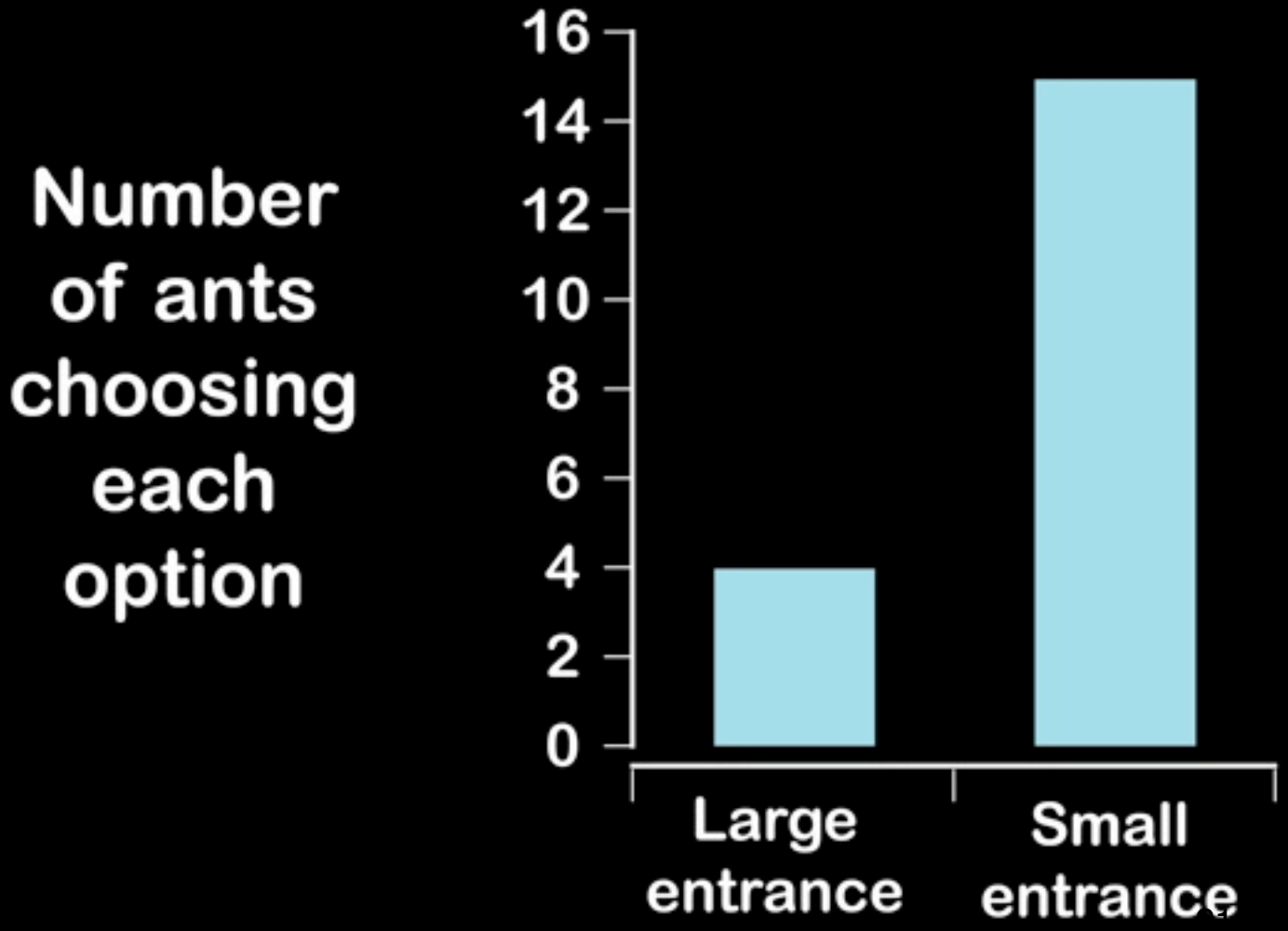
Setup for determining a lone ant's preference



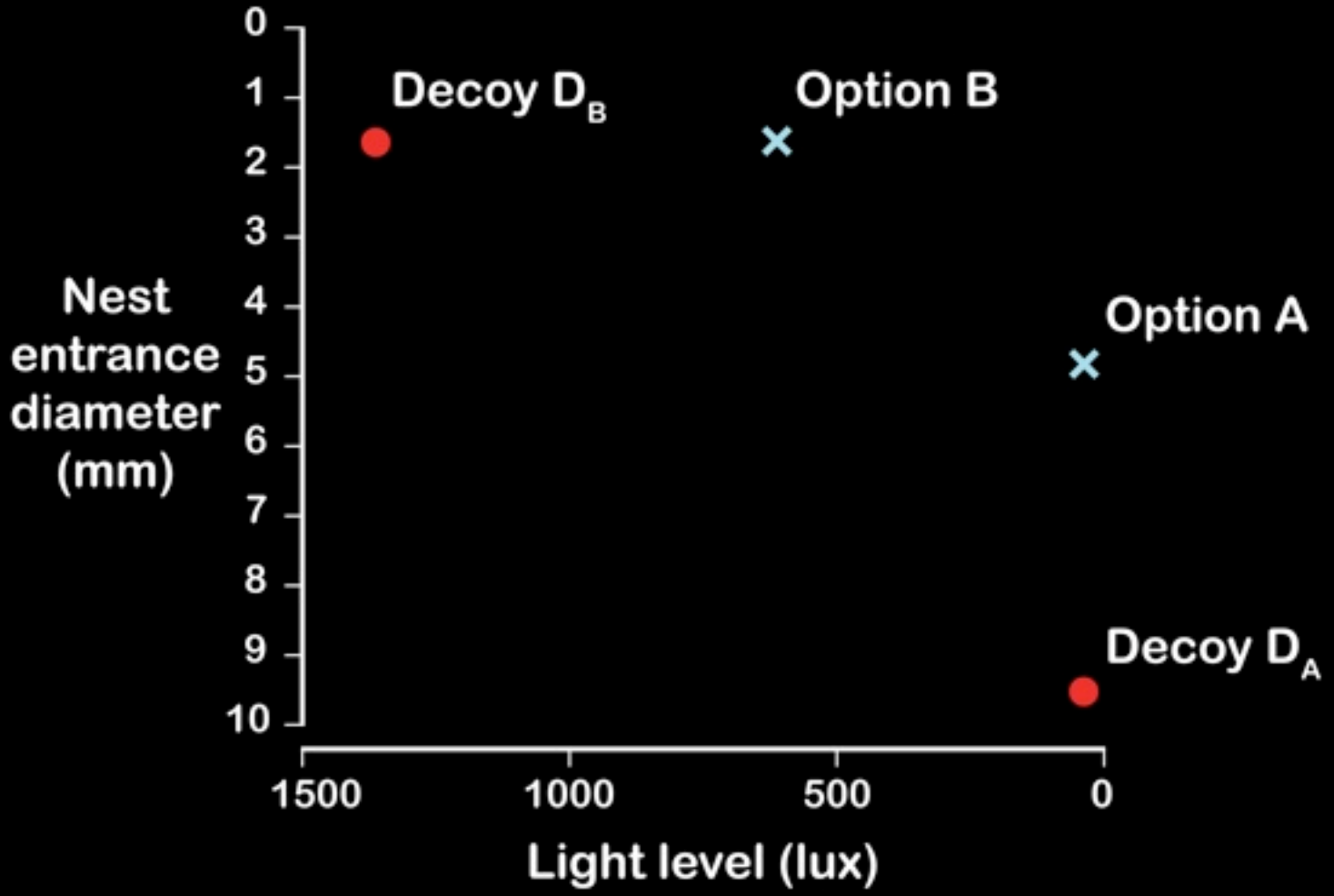
Ant moves all brood to nest with small entrance



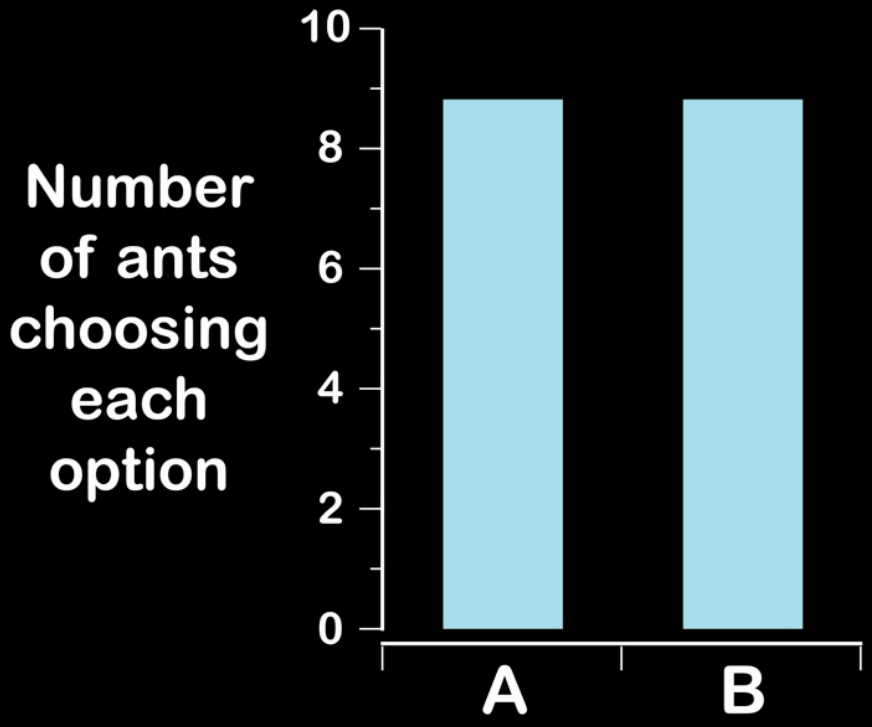
Lone ants pefer small entrance



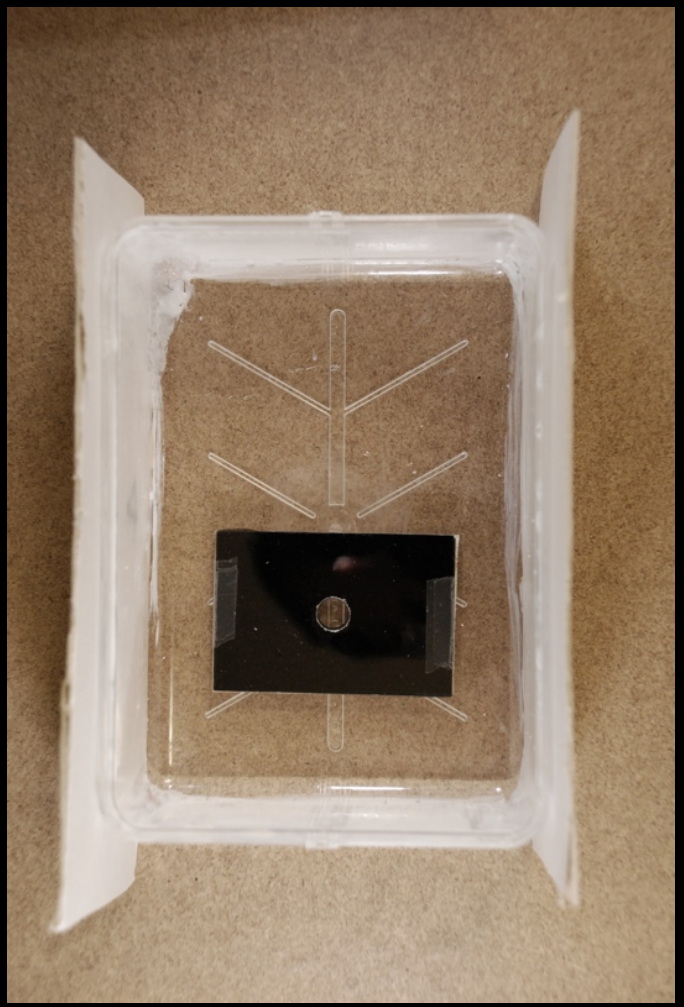
Targets and decoys for tests with lone ants



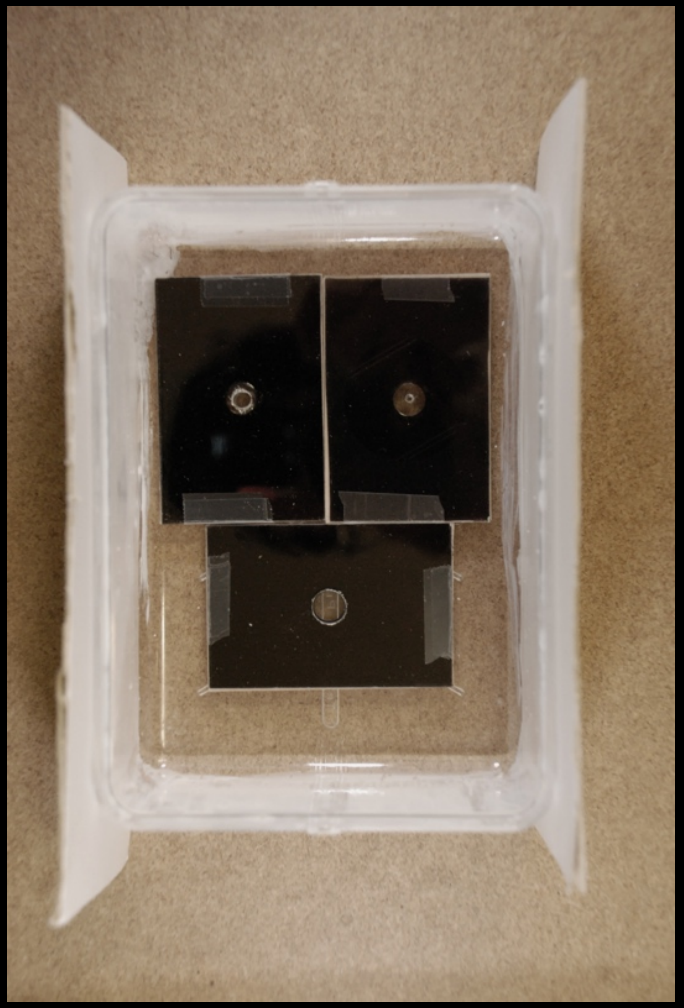
Ants are ambivalent about A and B



To test for IIA violation, ant is first allowed to move brood into decoy

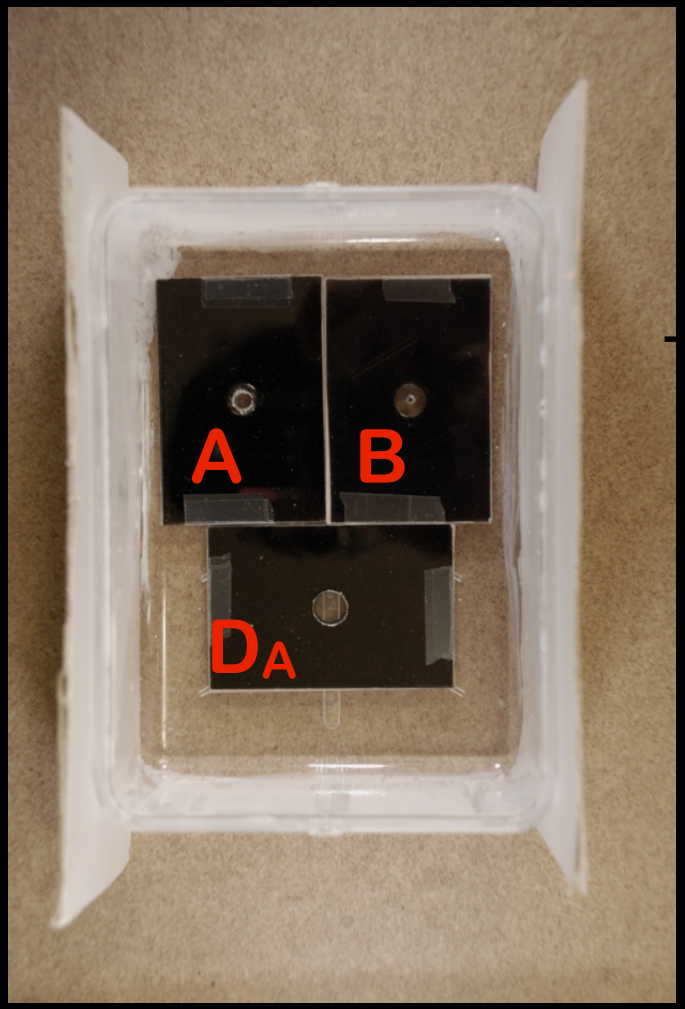


Ant is then given sites A and B, and allowed to choose one nest

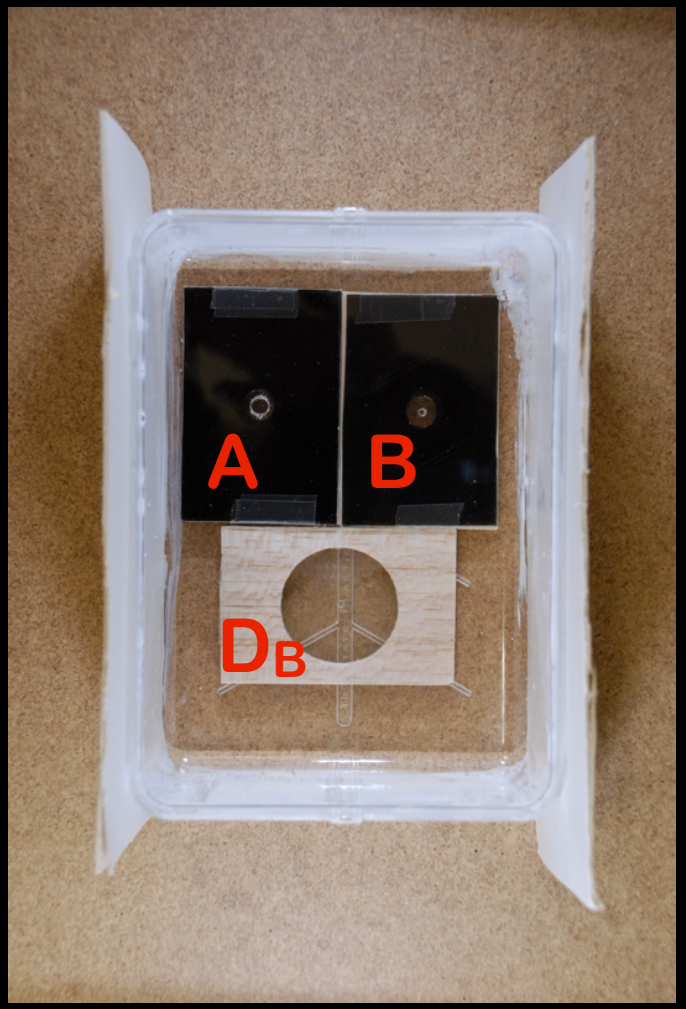


Two treatments

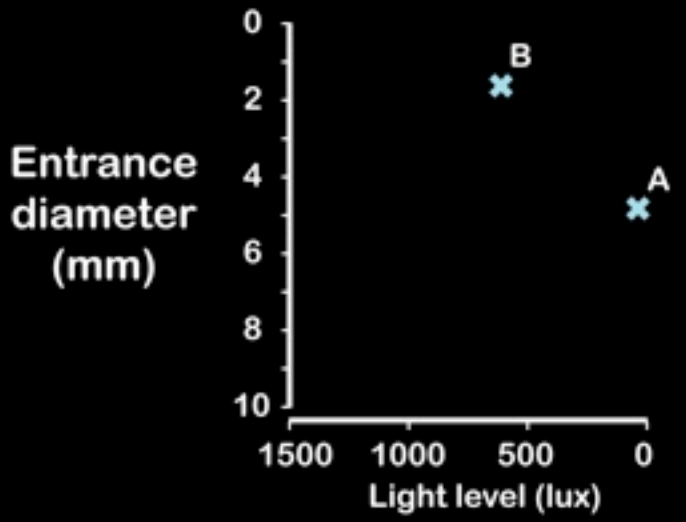
Choosing between A, B and D_A

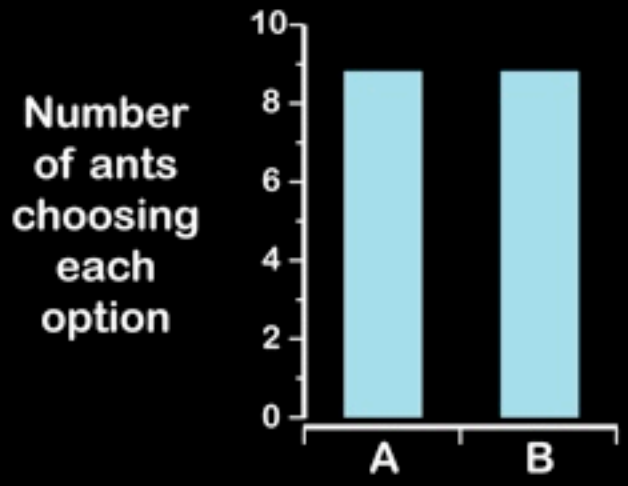


Choosing between A, B and D_B

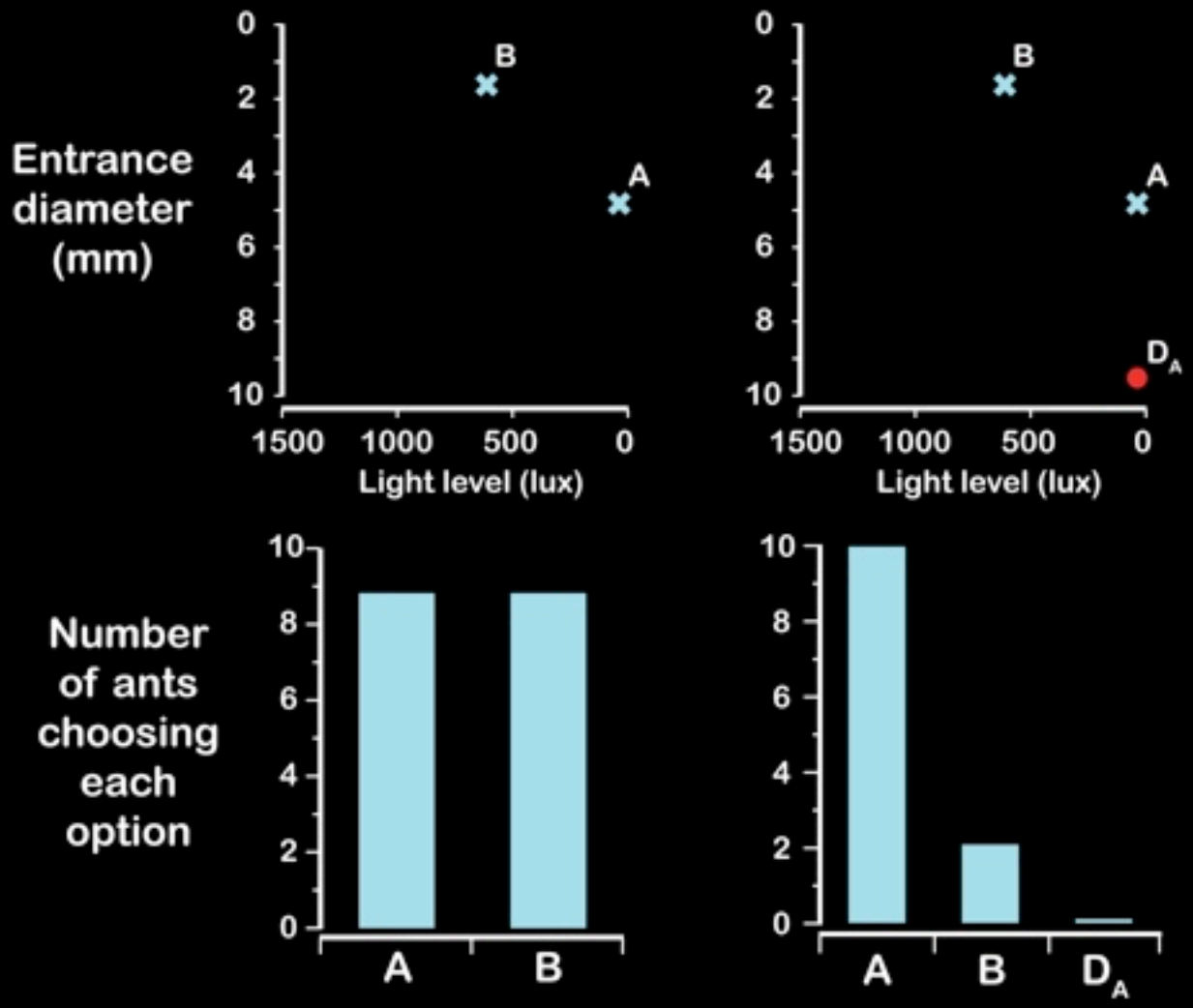


Ants are ambivalent about A and B

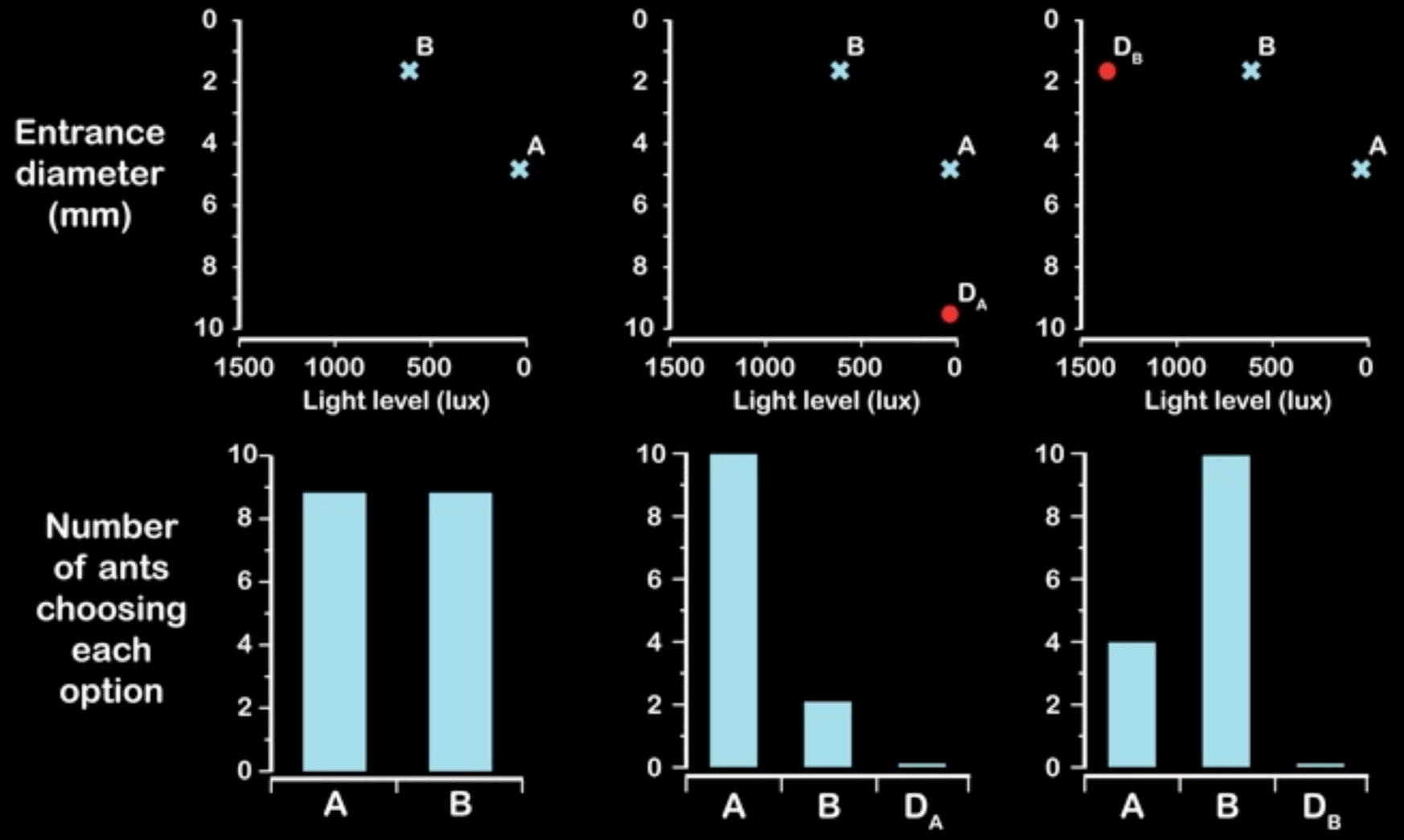




Decoy D_A enhances preference for A

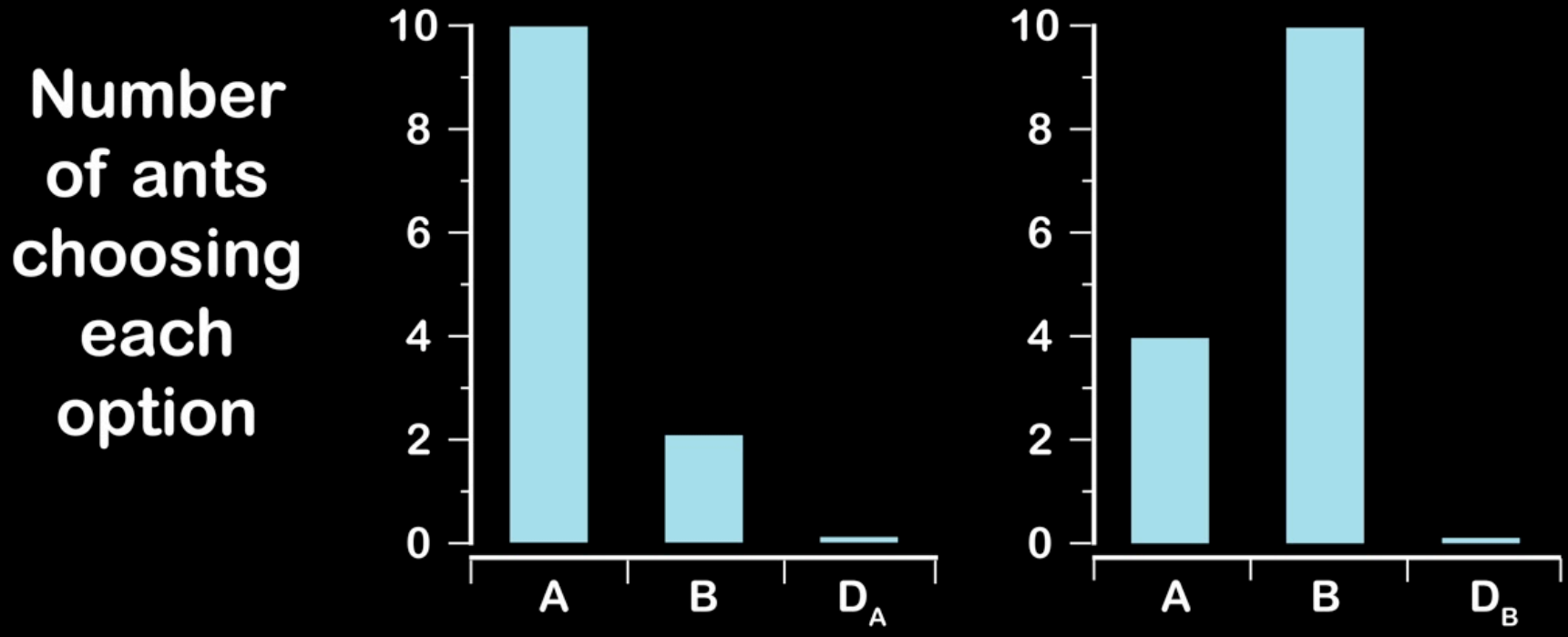


Decoy D_B enhances preference for B



Substituting D_B for D_A causes a significant preference reversal between A and B

$X^2 = 5.7$, $p = 0.02$



Acknowledgements

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