

**Université Toulouse 1 Capitole**  
**Ecole d'économie de Toulouse**

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**Session 1**

**Semestre 1**

Master 1 Econometrics, Statistics, Economics

Epreuve : Evolution of Economic Behaviour

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## ANSWER TWO QUESTIONS

- 1) What is Hamilton's Rule and how can it explain the evolution of cooperation in animal species such as the social insects? How relevant is this for understanding human cooperation?

**Answers will receive 5/10 for BOTH a) defining kin selection as the favoring by natural selection of traits that increase the fitness of an individual's relatives, AND b) correctly stating and interpreting Hamilton's rule ( $c < rB$ ). Extra marks for: c) pointing out that most human cooperation is between non-relatives; d) giving the coefficient of relatedness of siblings (0.5) or cousins (0.125) c) explaining why eusociality is often favored (as in some social insects) by haplodiploidy (sisters in social insects share 2/3 of their genes instead of 1/2 as in most sexually reproducing animals).**

- 2) "Experimental studies have shown us that human beings are not always completely selfish, but often care about the welfare of others. But there is large variation between subjects: selfish individuals coexist with altruistic individuals." How can we explain this?

**Answers will receive 5/10 for showing that experimental studies have established that subjects frequently contribute positive amounts in public goods games and dictator games even when the interactions are anonymous and one-shot, but that there is large variance between subjects in the extent of prosocial preferences. An additional 2-3 marks for those that go on to note that explaining the coexistence of selfish and altruistic preferences is easier if the returns to altruism are frequency-dependent. Extra marks for noting any of the possible mechanisms of frequency-dependence: a) punishment mechanisms that are less costly to defectors when defectors are scarce; b) high then declining private returns to investment in public goods; b) metabolic costs of selection of cooperative partners, which are not worth incurring when cooperators are frequent.**

- 3) What do biologists mean by "altruism"? How does the notion of "assortative matching" help to explain the evolution of altruism in this sense?

**Answers will receive 5/10 for noting that altruism to biologists is not an emotion or other psychological concept (it's any behavior raising fitness of another individual at a cost to fitness of the individual engaging in the behavior), and that this poses a puzzle since if it lowers fitness how can it have evolved? They receive 7/10 for noting that individuals' genes can leave copies of themselves without leading those individuals to have more descendants – they can lead OTHER individuals who also**

**bear copies of the genes to have more descendants. Extra marks for noting any of the following potential mechanisms: kin selection, multi-level selection, mutual recognition.**

- 4) What is an Evolutionary Stable Strategy in biological game theory and how is it related to the notion of Nash equilibrium in economic game theory?

**Answers will receive 5/10 for noting that an ESS is a strategy that, if adopted by the whole population, cannot be invaded by a mutant strategy that is initially rare. They will receive 7/10 for noting that it is similar to Nash equilibrium but not identical because ESS is defined in conditional-response terms and is not an instance of optimization. Extra marks for noting that the game Harm-thy-Neighbor has two Nash equilibria but only one ESS (because a strategy can invade initially through genetic drift).**

- 5) Is the modern world more violent than it has ever been? What explains the change in the rates of violence over the course of history?

**Answers will receive 5/10 for noting that estimates of the rate of violent death, at about 1.3% of all deaths in the world today, are about 1/10 of the estimated rates of violent death in forager societies as noted by Bowles (2009). Extra marks for a) showing that historical rates of violence have declined gradually over the centuries and are therefore unlikely to have a single explanation, b) discussing Norbert Elias's theory and its limitations.**