Repeated Games

		Player 2	
		Cooperate	Shirk
Player 1	Cooperate	10,10	2,16
	Shirk	16,2	5,5

- In this Prisoner's Dilemma game Shirk is a dominant strategy for both players. Therefore (Shirk, Shirk) is the outcome yielding a payoff of (5,5). This is unfortunate since could get (10,10) if they cooperate. So one important question is how we can sustain cooperation in this game.
- If we could somehow "punish" those who shirk then maybe we can sustain cooperation. But if this game is played only once, then there is no way to punish anybody. However in real life most interactions are repeated. Therefore it is natural to consider the repeated version of the Prisoners Dilemma.

Infinitely Repeated Prisoner's Dilemma

Let us first consider the case where the Prisoner's Dilemma is played each period and players care for their total payoffs (possibly with some discounting). Consider the following strategies:

- **Grimm Trigger:** Cooperate in the first period. Keep cooperating until your opponent shirks and start shirking once your opponent shirks.
- **Tit-for-Tat:** Cooperate in the first period. Mimic your opponents last move after that.

- If both players play the Grimm Trigger strategy then this is a Nash equilibrium and that sustains Cooperation for all periods. (The reason is that nobody wants to provoke the other one simply to get one period benefits).
- Similarly both players playing the Tit-for-Tat strategy or one playing the Tit-for-Tat and the other the Grimm Trigger are also Nash equilibrium. In these situations too Cooperation is sustained in each period.
- The Tit-for-Tat strategy performs very good in experiments. One may wish to adopt it in real life "games" especially if misperceptions are possible.
- On the other hand the Grimm Trigger strategy is very harsh. One misperception might lead to shirking forever.

Finitely Repeated Games: Back to Shirking

- Let us consider the case where the Prisoner's Dilemma is played k times and let's assume both players know k.
- Then in the last period (i.e. period k) there is no point in cooperating sine there is no future to worry about. Therefore both players will shirk in period k. Then in period k-1, knowing that both of them will shirk in period k anyway, they can shirk as well. This reasoning continuous up to the first period and both players shirk at each period.

- *Question*: But in real life cooperation is sustained in finitely repeated games; howcome?

  We can give two answers to this question:

- *Answer 1*: If agents do not know k, that is if they do not know when the last period is, then at each period there is a potential future to worry about and hence cooperation may be sustained.

- *Answer 2*: If there are "nice" players who are non-strategic and who cooperate no-matter what, we may want to give the impression that we are one of them and cooperate at least at the beginning.