Yuliy Sannikov
Clark Medalist 2016

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He studied mathematics at Princeton as an undergraduate and completed his PhD in economics at the Stanford Graduate School of Business.

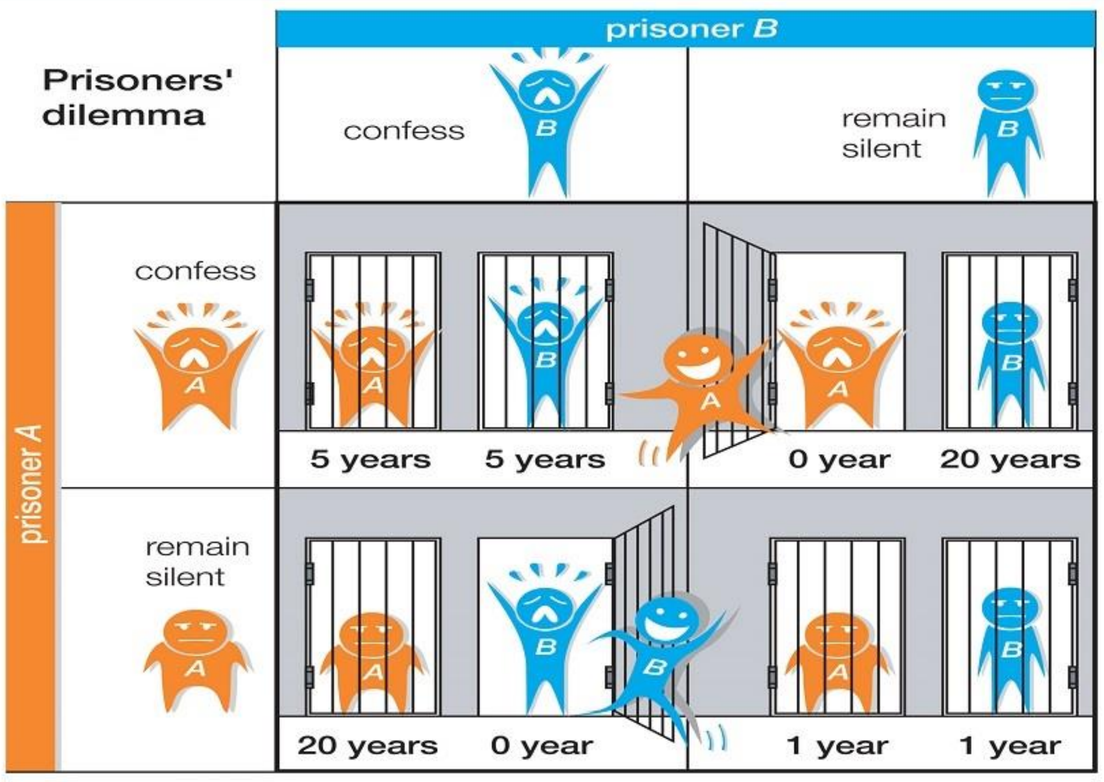
He received the John Bates Clark Medal in 2016 , by developing methods that offer new insights in analyzing problems in game theory, contract theory, corporate finance and macroeconomics, which had seemed well-studied and familiar.

Game Theory

A simple example is the **Battles of the Sexes game** , in this game a pair of couple are trying to either shopping or boxing .Although the woman prefers shopping and the man prefers boxing , they prefer to be at the same event rather than ending up at different places. Suppose they follow simple strategies of rotating what they do: boxing on Saturday and shopping on Sunday. The **payoff matrix** of the game is below:

		WOMAN: Boxing	WOMAN: Shopping
MAN	Boxing	2 , 1	0 , 0
MAN	Shopping	0 , 0	1 , 2

Prisoners' Dilemma



The **prisoner's dilemma game** can be used as a model for many real world situations involving cooperative behavior. If the game is played once, two **rational** individuals might not cooperate, even if it appears that it is in their best interests to do so. What if the game is played repeatedly , as in real life?

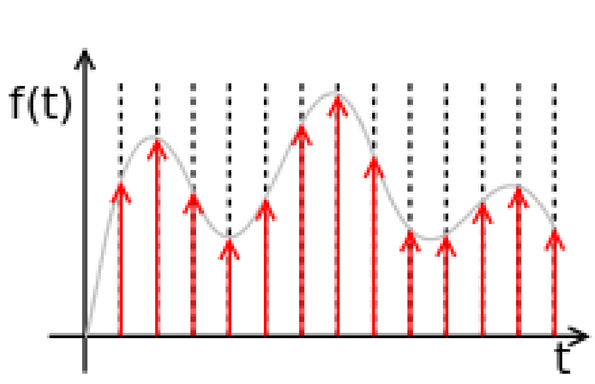
Continuous-Time Methodology

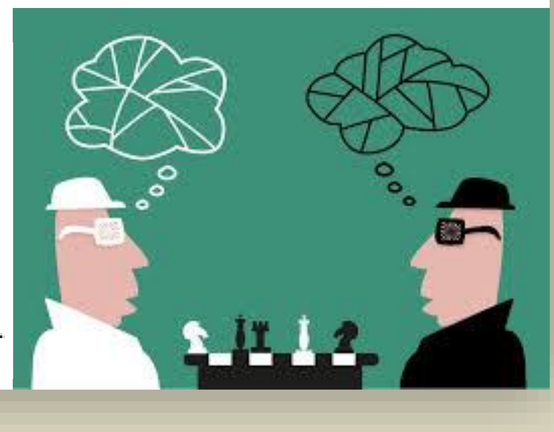
Repeated games are important models economists use to study repeated strategic interactions in which the agents face tension between opportunistic and cooperative behavior. Application ranges from social dilemmas to team production to tacit collusion.

Before Sannikov's work, a widely recognized problem was that, for example in a repeated game of Prisoners' Dilemma where actions are perfectly observed , writing the model in continuous time creates a situation in which any prisoner who deviate from an equilibrium path (confess) can be immediately punished.

Key insight in Sannikov's work is that if we introduce **imperfect monitoring** , a feature of many real-world environments, players cannot observe the action but the **imperfect signal** of the action . These signal may be distorted by **Brownian motion** , so the signal cannot accurately reflect the action. If an agent deviates, it takes time for one to become confident of the deviation .

With this assumption , writing the models in continuous time become meaningful . Sannikov applied the mathematical tools of stochastic calculus to formulate his model, the stochastic element naturally captures situations in which there is a **random chance that monitoring ,communication, or signaling between players is imperfect**.





Why does the research matter ?

- Innovative approaches allow both more realistic assumptions and conclusions
- His continuous-time models allow previously complicated games to be analyzed elegantly and neatly
- His foundational work makes room for a wide range of application , for example ,**principal-agent problem** in **Contract Theory**, **security design** ,**firm financing** and **macroeconomics models** under financial frictions.
- His work provide insights to solve problems like how companies motivate their workers through piece rates, bonuses ,and promotions ,how income inequality is connected with productivity , investment ,and economic growth , and how financial contracts and capital structure gives incentives to the managers of a corporation.

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