

**5. Dezember 2007, 18:15 Uhr**

**Martin NOWAK**

Harvard University, Cambridge, MA

## **Five Rules for Cooperation**

Cooperation means that one individual pays a cost for another to receive a benefit. Cost and benefit are measured in terms of fitness. Reproduction can be genetic or cultural. Cooperation is essential for constructing new levels of organization in biology. The emergence of genomes, cells, multi-cellular organisms and human society are all based on cooperation. Cooperation enables evolution to be constructive. Martin Nowak will discuss five mechanisms for the evolution of cooperation: kin selection, group selection, graph selection, direct reciprocity and indirect reciprocity. Each mechanism leads to a simple rule that specifies whether cooperation can be favored by natural selection. Martin Nowak will argue that indirect reciprocity is the key mechanism for the evolution of social intelligence and human language.

Moderator: **Karl SIGMUND** (Uni Wien, ÖAW)

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## **JOHANN RADON LECTURES**

**Veranstalter:** Österreichische Akademie der Wissenschaften (ÖAW) gemeinsam mit der Industriellenvereinigung Wien

**Veranstaltungsort:** Österreichische Akademie der Wissenschaften, Festsaal  
1010 Wien, Dr. Ignaz Seipel-Platz 2

**Nächster Termin:** Mittwoch, 9. Jänner 2008, 18:15 Uhr  
Paul EMBRECHTS (ETH Zürich)

### **Quantitative Risk Management (QRM)**

#### **Über Mathematik und Risiko bei Banken und Versicherungen**

Quantitative Risk Management (QRM) befasst sich mit der Fragestellung der quantitativen Analyse von Risiken. Aufsichtsrechtliche Gremien sind ein starker Antrieb für Banken und Versicherungen diese Quantifizierung voran zu treiben. Auf Basis dieser Analyse wird Risikokapital berechnet um mit hoher Wahrscheinlichkeit unerwartete Marktereignisse abfangen zu können. Folgende Themen aus dem Bereich des QRM werden herausgegriffen: Value-at-Risk, Extremalereignisse, Abhängigkeitsmodellierung, Risikoaggregation, Operationelles Risiko. Eine entscheidende Frage für die Praxis ist die Differenzierung zwischen Finanzrisiken, die sich sinnvoll quantitativ erfassen lassen und solchen, bei denen ausschließlich eine qualitative Beschreibung Sinn macht. Neben der quantitativen Messung von Risikozahlen ist auch ihre Aggregation eine wichtige Aufgabe der QRM, deren Lösung anspruchsvolle Mathematik erfordert. Die fundamentale Rolle der Mathematik in den Bereichen der Preisbestimmung und Absicherung von Finanzderivaten ist unbestritten. Die Hauptthese ist, dass auch bei regulatorischen Fragestellungen aus den Bereichen der Finanz- und Versicherungsaufsicht die Mathematik nicht weg zu denken ist.

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## Martin NOWAK – biografischer Hintergrund

Martin A. Nowak is Professor of Biology and of Mathematics at Harvard University and Director of Harvard's Program for Evolutionary Dynamics. Dr. Nowak works on the mathematical description of evolutionary processes including the evolution of cooperation and human language, the dynamics of virus infections and human cancer. His major discoveries include: the mechanism of HIV disease progression (1991), spatial game dynamics (1992), generous tit-for-tat and win-stay, lose-shift (1993), the rapid turnover and evolution of drug resistance in HIV infection (1995), quantifying the dynamics of HBV infection (1996), mechanisms for the evolution of genetic redundancy (1997), the evolution of cooperation by indirect reciprocity (1998), the first mathematical approach for studying the evolution of human language (1999-2002), evolutionary game dynamics in finite populations and the 1/3 rule (2004), evolutionary graph theory (2005), the first quantification of the in vivo kinetics of a human cancer (2005), and five rules for the evolution of cooperation (2006). At the moment he is working on 'prelife', which is a formal approach to study the origin of evolution.

An Austrian by birth, he studied biochemistry and mathematics at the University of Vienna with Peter Schuster and Karl Sigmund. He received his Ph.D. *sub auspiciis praesidentis* in 1989. He went on to the University of Oxford as an Erwin Schrödinger Scholar and worked there with Robert May, the later Lord May of Oxford, with whom he co-authored numerous articles and his first book, *Virus Dynamics* (OUP, 2000). Nowak was Guy Newton Junior Research Fellow at Wolfson College and later Wellcome Trust Senior Research Fellow in Biomedical Sciences and E. P. Abraham Junior Research Fellow at Keble College. Dr. Nowak became head of the mathematical biology group in Oxford in 1995 and Professor of Mathematical Biology in 1997. A year later he moved to Princeton to establish the first program in theoretical biology at the Institute for Advanced Study. He accepted his present position at Harvard University in 2003.

A corresponding member of the Austrian Academy of Sciences, Dr. Nowak is the recipient of Oxford's Weldon Memorial Prize, the Albert Wander Prize given by the University of Bern, the Akira Okubo Prize of the Society for Mathematical Biology, the Roger E. Murray Prize awarded by the Institute for Quantitative Research in Finance, the David Starr Jordan Prize given jointly by Stanford, Cornell, and Indiana universities, and the Henry Dale Prize of The Royal Institution, London. He has delivered numerous lectures in the United Kingdom, Europe, and the United States and is a former member of the Templeton Foundation Board of Advisors. Dr. Nowak is the author of more than 250 papers published in scientific journals. His latest book, *Evolutionary Dynamics*, which was published by Harvard University Press last year, provides an overview of the powerful yet simple laws that govern the evolution of living systems.

**Quelle:** <http://www.ped.fas.harvard.edu/people/faculty/index.html>