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Final Report: Modeling the Dynamics of Conflict and Cooperation Within and Between Multifarious Social Groups

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14. ABSTRACT

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a. REPORT	b. ABSTRACT	c. THIS PAGE			Sergey Gavrilets
UU	UU	UU	UU		19b. TELEPHONE NUMBER 865-974-8136

RPPR Final Report
as of 12-Dec-2019

Agency Code:

Proposal Number: 66117LS **Agreement Number: W911NF-14-1-0637**
INVESTIGATOR(S):

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Country: USA
DUNS Number: 003387891 EIN: 626001636
Report Date: 14-Dec-2019 Date Received: 10-Dec-2019
Final Report for Period Beginning 15-Sep-2014 and Ending 14-Sep-2019
Title: Modeling the Dynamics of Conflict and Cooperation Within and Between Multifarious Social Groups
Begin Performance Period: 15-Sep-2014 **End Performance Period:** 14-Sep-2019
Report Term: 0-Other
Submitted By: Sergey Gavrilets Email: gavrila@utk.edu
Phone: (865) 974-8136
Distribution Statement: 1-Approved for public release; distribution is unlimited.

STEM Degrees: **STEM Participants:**

Major Goals: The account was closed and the work on this grant stopped on 9/14/2019

Accomplishments: The account was closed and the work on this grant stopped on 9/14/2019

Training Opportunities: Nothing to Report

Results Dissemination: Lectures by the PI were given at:

Socio-Technological Evolution of the Human Species Workshop, Villa Galilee, ISRAEL

Social Decisions Workshop, University of Houston

Honors and Awards: Nothing to Report

Protocol Activity Status:

Technology Transfer: Nothing to Report

ARTICLES:

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Publication Type: Journal Article Peer Reviewed: Y **Publication Status:** 4-Under Review
Journal: Science Advances
Publication Identifier Type: Publication Identifier:
Volume: Issue: First Page #:
Date Submitted: 12/10/19 12:00AM Date Published:
Publication Location:
Article Title: Horizontal inequality and instability
Authors: S. Gavrilets, D. Ruck, A. Bentley
Keywords: cooperation, unrest, social norms, heterogeneity , modeling
Abstract: Horizontal inequality - economic, social and political inequality between different identity groups - is an important contributor to violent conflicts within societies. To deepen our understanding of the underlying social dynamics, we develop a mathematical model describing cooperation and conflict in a society composed by multiple factions engaged in economic and political interactions. Our model predicts that growing economic and political inequality tends to lead to the collapse of cooperation between factions that were initially seeking to cooperate. Certain mechanisms can delay this process, including the decoupling of political and economic power through rule of law and allegiance to the state or dominant faction. Counter-intuitively, anti-conformity can also stabilize society, by preventing initial defections from cascading. Heterogeneity in resources between factions makes the society more stable to negative effects of inequality
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Publication Type: Journal Article Peer Reviewed: Y **Publication Status:** 4-Under Review
Journal: Evolution and Human Behavior
Publication Identifier Type: Publication Identifier:
Volume: Issue: First Page #:
Date Submitted: 12/10/19 12:00AM Date Published:
Publication Location:
Article Title: Evolving institutions for collective action by selective imitation andself-interested design
Authors: S. Gavrilets, M. Duwal Shrestha
Keywords: cooperation, conflict, institutions
Abstract: Human behavior and collective actions are strongly affected by social institutions. A question of great theoretical and practical importance is how successful social institutions get established and spread across groups and societies. Here, using institutionalized punishment in small-scale societies as an example, we contrast two prominent mechanisms - selective imitation and self-interested design - with respect to their ability to converge to cooperative social institutions. While selective imitation has received a great deal of attention in studies of social and cultural evolution, the theoretical toolbox for studying self-interested design is limited. Recently we expanded this toolbox by introducing a novel approach, which they called foresight, generalizing standard myopic best response for the case of individuals with a bounded ability to anticipate actions of their group-mates and care about future payoffs. Here we apply this approach to two general types of collect
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Journal: Presgraves Communications
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Date Submitted: 12/10/19 12:00AM Date Published:
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Article Title: Spatially explicit analyses reveal ecological and historical signals in the evolution of large-scale human societies
Authors: T. E. Currie, P. Turchin, Edward Turner, S. Gavrilets
Keywords: cooperation, modeling, empires, warfare
Abstract: Understanding why large, complex human societies have emerged and persisted more readily in certain regions of the world than others is an issue of long-standing debate. Here we systematically test a range of hypotheses involving the socio-ecological factors that may ultimately promote or inhibit the formation of large, complex human societies. We employ spatially explicit statistical analyses using data on the geographical and temporal distribution of the largest human groups over a 3000 year period of history. The results support the predictions of two complementary hypotheses indicating that large-scale societies developed more commonly in regions where i) agriculture has been practiced for longer (thus providing more time for the norms & institutions that facilitate large-scale organization to emerge), and ii) warfare was more intense (thus creating a stronger selection pressure for societies to scale up). We found no support for the influential idea that large-scale societies were
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Journal: Proc B Royal Soc
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Article Title: The multinomial index: a robust measure of reproductive skew in animal societies
Authors: Cody T. Ross, Adrian V. Jaeggi, Monique Borgerhoff Mulder , Jennifer E. Smith, Eric Alden Smith6 , Se
Keywords: inequality, reproductive skew, mating systems, social evolution, phylogenetic comparative analysis
Abstract: Inequality or skew in reproductive success (RS) is common across many animal species and is of long-standing evolutionary interest, especially to the study of social evolution. However, the measurement of reproductive inequality in natural populations has been methodologically challenging because existing quantitative measures of reproductive skew are highly sensitive to variation in sample or population size, mean RS, and age-structure. This poses a barrier to empiricists wishing to test predictions derived from theoretical models, especially when using comparative data collected from multiple populations and/or species. Here we present a new measure of reproductive skew, the multinomial index, M , that is unaffected by many of the issues affecting existing indices. M is analytically related to Nonacs' binomial index, B, and comparably accounts for heterogeneity in age across individuals. We further generalize the measure to allow for the possibility of diminishing RS returns to age.
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Journal: Nature Human Behavior
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Date Submitted: 12/10/19 12:00AM Date Published:
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Article Title: The dynamics of injunctive social norms
Authors: S Gavrilets
Keywords: cooperation, conflict, norms, punishment
Abstract: Injunctive social norms are behaviors that one is expected to follow and expects others to follow in a given social situation; people also expect that norm violations will result in disapproval or punishment. Injunctive norms govern all aspects of our social life but the understanding of their effects on individual and group behavior is currently lacking. Here I develop a general mathematical approach describing the dynamics of injunctive norms in heterogeneous groups. My approach captures various costs and benefits, both material and normative, associated with norm-related behaviors including punishment and disapproval by others. It also allows for errors in decision-making and explicitly accounts for differences between individuals in their values, beliefs about the population state, and sensitivity to the actions of others. As illustration, I consider policies developed by practitioners to abolish the norms of footbinding and female genital cutting, to decrease college students' dri
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Journal: Advances in culture and psychology
Publication Identifier Type: Publication Identifier:
Volume: Issue: First Page #:
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Publication Location:
Article Title: Foresight and cooperation
Authors: S Gavrilets
Keywords: cooperation, punishment, norms, collective action
Abstract: Understanding the evolution of social behaviors, norms, and institutions, which are at the core of all human cultures, requires understanding human decision-making processes. Two important characteristics of humans are that people care about future payoffs and that they have the “theory of mind” which allows them to predict to a certain extent the reaction of their social partners to their own actions. In evolutionary game theory, these characteristics can be modeled by a recently introduced strategy update method called foresight. This chapter discusses applications of foresight to several evolutionary games describing the effects of punishment on cooperation in repeated dyadic or group interactions. It is argued that foresight is able to solve both the first and second order free-rider problems simplifying cooperation and the evolution of social institutions. Moreover it can maintain social norms. Foresight can also undermine cooperation by allowing for manipulation and tactical dece
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Journal: Royl Soc Interface
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Publication Location:
Article Title: The Yellow Vests Movement - a case of long transient dynamics?
Authors: Andrew Morozova , Sergei Petrovskiia and Sergey Gavrilets
Keywords: social dynamics; yellow vests; regime shift; long transients; ghost attractor
Abstract: Understanding the dynamics of protests and social unrest is important in order to ensure a stable, sustainable development of the society. Mathematical models of social dynamics have been increasingly recognized as a powerful research tool in achieving this goal. Here, motivated by the fact that the dynamics of the ongoing Yellow Vest Movement in France exhibit anomalously long duration (currently it is in 30th week), we explore whether this can be a result of a dynamical systems phenomenon known as long transients. To this end, we build and study a hierarchy of mathematical models describing the “population dynamics” of the movement, i. e. how the number of protesters changes with time. We show that in these models long transients appear via two roots: via a ghost attractor and via an interaction of the slow and fast dynamics. We demonstrate that long transients are also present in some earlier models of social protests. Interestingly, our models predict that the Yellow Vest Movement s
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Date Submitted: 12/10/19 12:00AM Date Published:
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Article Title: Human Origins 2021
Authors: Sergey Gavrilets, Peter J Richerson, and Frans de Waal
Keywords: evolution, culture, modeling
Abstract: We argue that research on human origins and our subsequent cultural and social evolution is vital not only for foundational scientific discovery but also for understanding, mitigating, and solving the most pressing challenges faced by our society. Advancing research on human origins and social complexity is also very timely given recent advances and emerging opportunities. Fully capitalizing on these requires a concerted transdisciplinary effort of researchers from a diverse set of disciplines. Success in this endeavor could yield tremendous gains for society.
Distribution Statement: 1-Approved for public release; distribution is unlimited.
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Nothing to report in the uploaded pdf (see accomplishments)