7th TOULOUSE ECONOMICS AND BIOLOGY WORKSHOP

Cultural Evolution

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TITLES AND ABSTRACTS

Erol AKCAY, *University of Pennsylvania*

Title: Social Norms as Coordination Devices and Generators of Prosocial Preferences

Abstract: Social norms are complex emergent phenomena that result from the interaction of mechanisms at multiple scales, from individual level cognition to population level gene-culture coevolution. Some social norms prescribe particular behaviors and induce expectations and preferences on others' behaviors to turn social dilemmas into coordination games while others coordinate individual behavior to implement correlated equilibria that improve on Nash equilibrium outcomes. In this talk, I will present two models that consider different aspects of social norms, first, as “choreographers" of individual behavior in social interactions, and second as a mechanism to induce pro-social preferences. In the first model, we consider the emergence of normative meaning of random events in the world. These events have no inherent relevance to the social interaction or payoffs of individuals, but individuals can interpret them as prescribing certain behaviors and implying expectations about others’ behavior. These interpretations can thus give rise to prescriptive and descriptive norms. We then consider the evolutionary dynamics of such interpretations, and how that the evolutionarily stable interpretations implement correlated equilibria of the game being played. This result highlights that norms coordinating individual behavior can arise spontaneously without a central agency and without common knowledge or information exchange between agents. In the second model, we consider a public goods game with a co-evolving group contribution norm, external punishment, and internalized preferences for complying with the norm. We show that evolving intrinsic preferences for compliance may require the presence of external punishment, but the two are jointly stable only when the public goods exhibit sufficient complementarity. This result underscores the complex interplay between intrinsic and extrinsic incentives and how they might constrain the evolution of efficient social norms.

Ingela ALGER, *CNRS - TSE - IAST* and Jörgen WEIBULL, *IAST*

Title: Evolution of Preferences in Structured Populations: Genes, Guns, and Culture

Abstract: During human evolution, individuals interacted mostly within groups of small size that were connected by limited migration and sometimes by conflicts. Which preferences, if any, will prevail in such scenarios? Building on population biology models of spatially structured populations, and assuming individuals' preferences to be their private information, we characterize those preferences that, once established, cannot be displaced by alternative preferences. We show that such uninvadable preferences represent different motives when expressed in terms of fitness than when expressed in terms of material payoffs. At the fitness level, individuals can be regarded to act as if driven by a mix of self-interest and a Kantian motive that evaluates own behavior in the light of the consequences for own fitness if other group members were to behave like oneself. This Kantian motive is borne out from (genetic or cultural) kin selection. At the material-payoff level, individuals can be regarded to act as if driven in part by self interest and a Kantian motive (now in terms of material payoffs), but also in part by other-regarding preferences towards other group members. This latter motive is borne out of group resource constraints (such as a fixed group size) and the risk of conflict with other groups. We show how group size, migration rates, risk of group conflicts, and cultural loyalty shape the relative strength of these diverse motives.

Éric CRUBEZY, *CNRS - AMIS Université Paul Sabatier*

Title: Cultural Evolution at the Contact of Native Populations and Europeans: Frozen Burials of Yakutia (North eastern Siberia, 1632/1922)

Co-authors : Sylvie Duchesne, Liubomira Romanova, Andaine Seguin-Orlando, Patrice Gérard, Vincent Zvenigoroski, Ludovic Orlando, Alexandre Ribéron

Abstract: In our attempt to study Yakutia's cultural evolution, we carried out archaeological, genetic and historical studies before and after the period of the contact (1632 AD) between native populations and Europeans. The greater part of the bodies and archaeological artefacts under study (1500- 1922) were found frozen and intact. We can study the material culture (artefacts, clothes, graves), the rituals funerary rituals, familial relationships (paleogenetic and genomic) and compare our findings with numerous historical and ethnographic studies to determine the degree to which they coincided or not. In this sense, Yakutia is a laboratory for the confrontation of archaeological, paleogenomic and historical studies at a time where paleogenomics aims to explain cultural diffusions, specially at prehistorical times.

Maxime DEREX, *University of Exeter and Université Catholique de Lille*

Title: The Cultural Evolution of Increasingly Efficient Technologies

Abstract: Highly-optimized tools are common in traditional populations. Bows and arrows, dogsleds, clothing, houses, and kayaks are just a few examples of the complex, exquisitely designed tools that humans produced and used to colonize new, demanding environments. Because there is much evidence that humans' cognitive abilities are unparalleled, many believe that such technologies resulted from our superior causal reasoning abilities alone. However, others have stressed that the high dimensionality of human technologies make them very hard to understand causally. Instead, they argue that optimized technologies emerge through the selective retention of small improvements across generations without requiring explicit understanding of how these technologies work. Here, I will present an experiment that supports the latter view by showing that a physical artifact becomes progressively optimized across generations of social learners in the absence of explicit causal understanding. Moreover, I will show that the transmission of causal models across generations has no noticeable effect on the pace of cultural accumulation. The reason is that individuals do not spontaneously create multidimensional causal theories but instead mainly produce simplistic models related to a salient dimension. Finally, I will show that the transmission of these inaccurate theories constrains learners' exploration and has downstream effects on their understanding. I will conclude with a discussion on the role of culturally evolved mental representations in cultural evolutionary processes.

Marcus W. FELDMAN, *Stanford University*

Title: Interpreting the Interactions between Genes and Culture

Abstract: The mean fitness is often used as a population's "utility" function. In this paper, I will explore the concept of evolutionary optimization and show some interesting contradictions between use of this utility, and true evolutionary stability in systems of cultural transmission. Some new results on the meaning of conformity will also be described. Finally, I will show how inferences about the historical demography of males and females can be distorted by the presence of cultural transmission.

Victor GAY, *TSE and IAST*

Title: Shocking Culture: World War I and Attitudes Toward Gender Roles Throughout a Century

Abstract: World War I in France induced many women to enter the labor force after the war, a shock to female labor that persisted over the long run. I rely on this historical shock to women's working behaviors to explore mechanisms that underlie the process of cultural change. I attempt to build a measure of attitudes that is consistent across time and space throughout the twentieth century by using legislative behaviors of French députés on gender-issues bills. Preliminary results indicate that the war had enduring implications for attitudes toward gender roles.

Herbert GINTIS, *UMass Amherst and Santa Fe Institute*

Title: Inclusive Fitness and the Sociobiology of the Genome

Abstract: Explaining the appearance of design is difficult because individual genes are utterly selfish in the sense of Dawkins. Explaining cooperation among loci in the genome is much harder than explaining social cooperation among individuals because individuals are not necessarily inclusive fitness maximizers, whereas individual genes are inclusive fitness maximizers. The best we have as an answer is that evolution promotes regulatory gene networks that bring individual loci in harmony with the fitness needs of the organism. Inclusive fitness theory cannot help us model such networks because inclusive fitness abstracts from inter-locus interaction. It follows from the sociobiology of the genome that group selection is natural selection FOR group social structure, not selection between groups

Barry HEWLETT, *Washington State University Vancouver*

Title: Intimate Living, Cultural Norms, and Social Learning among the Akaandother Hunter-Gatherers

Abstract: Hunter-gatherers provide one method by which we can attempt to understand the nature and contexts of the evolution of human cultures. The talk presents hunter-gatherer data on three domains often associated with the evolution of culture: cultural niche construction, cultural/social norms, and social learning. The cultural niche construction component of the talk examines four dimensions of the physical setting of hunter-gatherer life: settlements, houses, beds, and interpersonal touching. Cultural norms are considered in relation to how foundational schemas of egalitarianism, respect for autonomy, and sharing influence a broad range of norms and behaviors. Finally, systematic field data on two key features of human cumulative culture, teaching and overimiatation, are briefly presented. Interactions between the three domains are discussed and insights from hunter-gatherer studies on the evolutionary nature of culture are presented.

Sabine NÖBEL, *IAST*

Title: Cultural Transmission of Mating Preferences in Fruit Flies

Co-authors: Arnaud Pocheville, Guillaume Isabel & Etienne Danchin

Abstract: Many theoretical articles show that cultural transmission can essentially change the evolution of populations. Once considered unique to humans, animal culture has scant empirical evidence beyond mammals and birds, and we still know little about the process of cultural transmission. We propose a mechanism-driven definition of animal culture and test it in the fruit fly (*Drosophila melanogaster*). The definition requires that the five criteria discussed in the literature are verified. First, the transmitted trait should be socially learned, i.e., learned from conspecifics. We show that following the observation of a *Drosophila* female (called demonstrator female) choosing between two males of contrasted phenotypes for mating, leads an observer female to prefer males of the phenotype chosen previously. We further show that sexual preferences in drosophila are transmitted from older to younger individuals, memorized over the long-term, be in favor of any male of the same phenotype and in a conformist manner (i.e., females should learn to prefer the male phenotype chosen by the majority of demonstrators, whatever the level of majority). We then used computer simulations to study whether the observed cognitive characteristics can generate a statistical population-preference for a given male phenotype that persist along transmission chains in which the observers of one step become the demonstrators of the next step (i.e., whether social learning can foster the emergence of cultural traditions). Traditions readily emerge in population of sizes that exist in nature and conformity plays a key role in the emergence of such cultural traditions. Thus, Drosophila have all the cognitive abilities that can lead to the emergence of sustainable cultural traditions of preferring one type of male over other types of males, which considerably broadens the taxonomic scope of the cultural process.

Peter J. RICHERSON, *University of California Davis*

Title: Why Humans Evolve in the Pleistocene and Our Complex Economies in the Holocene?

Abstract: Human evolution presents two major macro-evolutionary puzzles. The first is why our basic adaptation evolved in the Pleistocene (2.6 million years ago until 10,700 years ago). The human big brain-culture-technology-large societies adaptive complex turned out to be a stunning success by the end of the Pleistocene. Other major adaptive breakthroughs like camera style eyes, internal skeletons, terrestrial locomotion, powered flight, and many others, evolved hundreds of millions of years ago. Why haven't human like adaptations been common for a long time? The second is why the evolution of immense societies resting on sophisticated economies with intricate divisions of labor and extensive trade arose only in the last 10.7 millennia (the Holocene). Macro-evolutionary explanations come in two flavors, ones that appeal to processes internal to the evolutionary process and ones that appeal to exogenous environmental forces. In the case of human evolution, the main internal factor seems to be that we inherited largish brains, manipulative hands, and a high degree of sociality from our ape ancestors. At any rate, unlike many other major adaptations, no other lineage has converged on our adaptation. On the other hand, many other lineages have evolved somewhat larger brains in during the Pleistocene, indicating a common external factor. The climate of the Pleistocene was cold, dry, and highly variable. Some high resolution core data suggest that variation on the scale of centuries and millennia increased in intensity as the Pleistocene unfolded. Theoretical models suggest that it is variation on this time scale that can support a costly capacity for culture (social learning) sufficiently sophisticated to lead to complex tools and complex, cooperative, social systems. Human brain size and cultural sophistication seem to have tracked the increasing millennial and sub-millennial scale variation, though data from more and longer high resolution paleoclimate and paleoecology data will test this conjecture more rigorously. Holocene climates have been comparatively low in millennial and sub-millennial scale variation as well as warmer and wetter than glacial ones. This led to the evolution of a myriad locally specialized subsistence systems, a great many of which are based on plant and animal domesticates. Agriculture's increase in production per unit land area led to higher population densities, which in turn favored a finer division of labor, larger scale trade, and more political complexity. Humans by now have come to be a major biogeochemical force on the global ecosystem, leading to an uncertain future despite our current spectacular success.

Mohamed SALEH, *TSE, Université Toulouse Capitole, and IAST*

Title: Marriage, Fertility, and Child Mortality before the Demographic Transition: Evidence from Nineteenth-Century Egypt

Co-author: Claire Galez-Davis

Abstract: There is a dearth of evidence on the determinants of fertility and child mortality before the demographic transition outside Western Europe and North America. This article has two objectives. The first objective is to document the inter-religious differences in fertility and child survival in mid-nineteenth-century Egypt, one century before its demographic transition. We employ a unique data source: two nationally representative individual-level samples from Egypt's population censuses of 1848 and 1868. The second objective is to explore the relative effects of socioeconomic status and religious beliefs in driving the differences. Our preliminary findings suggest that non-Coptic Christians had lower fertility than Muslims, Copts, and Jews. And while there were no inter-religion differences in fertility across Muslims, Copts, and Jews, the latter had more surviving children starting from age 7. We also find that socioeconomic status and religion have statistically significant yet orthogonal effects on fertility and child survival.

Paola SAPIENZA, *Northwestern University*

Title: Diversity in Schools: Immigrants and the Educational Performance of Natives

Co-authors: David Figlio (Northwestern University and NBER), Paola Giuliano (UCLA and NBER), Riccardo Marchingiglio (Northwestern University), Umut Ozek (American Institute for Research)

Abstract: We study the effect of exposure to immigrant peers on the educational outcomes of native students, using a unique dataset combining birth records and population-level administrative data from the Florida Department of Education. We focus on the cumulative cohort-school-specific exposure to foreign born students throughout a native student's educational career, and we identify our parameter of interest by comparing siblings' performances in standardized test scores in mathematics and reading. Our identification strategy and robustness analysis allows us to partial out the unobserved non-random selection into schools. We find a positive and statistically significant association between the cumulative exposure to foreign born students and native students' test scores. We study potential non –exclusive mechanisms that could drive the main result and find result consistent with the fact that immigrants behave better than natives and cause fewer disruption in daily activity, possibly improving the learning environment (Lazear, 2001).

Thierry VERDIER, *Paris School of Economics*

Title: Disorganization Theory, Repression and Crime Dynamics: A Simple Cultural Transmission Model

Co-authors: Emeline Bezin (PSE) and Yves Zenou (Monash University)

Abstract: We develop a two-period overlapping generations model in which both the structure of the family and the decision to commit crime are endogenous and a culture of honesty is transmitted intergenerationally by families and peers. By its effects on family structures and other channels of cultural transmission, increased crime repression in some intermediate range may backfire as it promotes the long termp prevalence of traits favoring crime behavior. Consistent with sociological disorganization theories of crime, the model also explains the emergence and persistence of urban ghettos characterized by a large proportion of broken families, high crime rates and localized crime cultures. Finally, the fraoemwork is used to discuss the efficiency of location and family policies on long-term crime rates.