

Invited Lecture

BIOLOGICAL VS CULTURAL DIFFERENTIATION DURING THE MIDDLE TO UPPER PALAEOLITHIC TRANSITION

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The biological differentiation of Upper Pleistocene populations is phylogenetically determined by the existence of two main lineages of archaic humans whose origins reach back to the Middle Pleistocene. On the one hand this is archaic *Homo sapiens* deriving from Africa on the other hand these are Neanderthals that evolved in western Eurasia. These two lineages met, for the first time, about 120-100 Kyr BP in the Near East where they existed parallelly until about 40 Kyr BP. Subsequently, their confrontation in Europe and western and central Asia took place at 45/42-28 Kyr BP.

This model, which is today commonly accepted on the basis of physical anthropology, is still questioned by palaeogenetists on the basis of fossile mt DNA. Most reports on the first identifications of fossile sequences of mt DNA seems to support the view that mt DNA of Neanderthals is totally unlike that of mt DNA of European modern humans. Consequently, a model would be acceptable of total replacement of Neanderthal populations by modern humans in the effect of the second „out of Africa” migration via the Near East to Europe and to western, possibly also central, Asia (Serre et al.2004, Currat, Escofer 2004, Caramelli et al. 2003).

Recently, however, arguments have appeared that suggest a certain contribution of Neanderthals in the formation of the genome of European modern humans. Some of these arguments point to genetic differentiation of Neanderthal populations in the period when they cohabited with modern humans (Schmitz et al.2002, Beauval et al.2005, Lalueza et al.2006), some others point to more divergent Neanderthal haplotypes before 45 Kyr BP (Orlando et al.2008). Effectively the hypothesis about the total replacement has to be re-assessed. Moreover, the fact should be taken into account that the identification of mt DNA of European modern humans is based on bone remains fom the period as late as 28-25 Kyr BP (i.e. from the period of the Gravettian), whereas we do not know mt DNA sequences of early *Homo sapiens* from the period of Neanderthal/Modern Man cohabitation. This makes the construction of new hypothesis of the process of diffusion of modern humans more difficult.

There are no such cases that would provide arguments in support of the hypothesis about autochthonous evolution of Neanderthals into anatomically modern humans.

Data that are significant for the discussion about the total replacement and about the contribution of Neanderthal populations to the emergence of European anatomically modern humans is the comparison of culture systems created by the two populations. In the period of their cohabitation in the Near East material cultures of the two populations were similar and corresponds to – broadly understood – the Near Eastern Levallois-Mousterian. Most importantly it should be stressed that the culture of archaic *Homo sapiens* in Northern Africa belongs too, to a taxonomic unit similar to some facies of the Mousterian of Neanderthals in Europe. The differences between the cultures could be seen, first of all, in the sphere of symbolic culture

(e.g. appearance of incised ornaments, personal adornments, grave furnishing etc), also in social organization and subsistence economy of Early modern humans in Africa and in the Near East.

To speak about variability on the level of mt DNA in European Neanderthals would be premature. Anthropological differences (physical features of populations) are diachronic (i.e. the difference between the Early Neanderthals from 250-120 Kyr BP and classical Neanderthals – 120 Kyr BP until their extinction), to a lesser degree regional (difference between Near East and European Neanderthals). Contrary to this the main cultural taxonomic units are phyletic in their nature i.e. these are long-lasting parallel cultural traditions. To these belong the Mousterian (which developed from ca 270Kyr BP until 40-30 Kyr BP), the Micoquian (developing from more than 200 Kyr BP till about 35-30 Kyr BP), microflake industries (that appeared in most of warmer oscillations from MIS 9 until MIS 3) and others.

However, the appearance of anatomically modern humans in Europe and western Asia is associated with specific allochthonous cultural context. In my opinion there are two taxonomic complexes in Europe that represent the first anatomically modern humans:

the first is the initial Upper Palaeolithic characterized by the evolution of Levallois into blade technology and the replacement of stylistics of „Mousteroidal” tools by the Leptolithic stylistics. In this complex belong the Bachokirian in the Balkans and the Bohunician in Central Europe. Their origin is, most probably, rooted in the Emirian in the Near East, while their diffusion took place via Anatolia and the Balkans.

the second tradition – which functioned in the northern Mediterranean (and middle Danube basin) – is the Proto-Aurignacian (also referred to as the Fumanian), deriving from the Near Eastern Ahmarian and – possibly – from the Baradostian in the Middle East. The route of the diffusion of this tradition into Europe would have led on the southern as well as the northern side of the Black Sea.

The diffusion of the two traditions still hypothetically ascribed to anatomically modern humans must have occurred earlier than it has been so far assumed, before the eruption of Phlegrean Fields volcanoes which is placed at 39.3 Kyr BP. This supposition is confirmed by recent AMS determinations (ABA method, notably ABOX) for Upper Palaeolithic layers covered by Campanian Ignimbrite in the territory of Italy as far as the Russian Lowland.

The Initial Upper Palaeolithic with Levallois technology and the Proto-Aurignacian, are not only bearers of leptolithic technologies (in the case of the Fumanian of bladelet technology) but also of innovations in the sphere of symbolic culture and social organization including the appearance of rock art (Fumane Cave).

In the period of Neanderthal/Modern Humans cohabitation in Europe Neanderthal cultures, too, further evolved. On the substratum of the Mousterian and the Micoquian the so-called „transitional cultures” appeared which combined Middle and Upper Palaeolithic characteristics. From the Mousterian the Chatelperronian derives in western Europe and the Uluzzian in western Mediterranean, whereas from the Micoquian derive the Szeletian in central Europe and the Streletskian-Sungirian in eastern Europe. Regrettably, there is very little data on biology of populations responsible for the emergence of these units. We know, nevertheless, that at least the Early Phases of the Chatelperronian and the Szeletian can be ascribed to Neanderthals. When we take into account the fact that „transitional cultures” (for example Szeletian and Streletskian-Sungirian) persisted for a very long time: until the Middle Phase of the Upper Palaeolithic (as far as the beginning of MIS 2 – LGM) it can be assumed that Later Phases of these units

were created already by anatomically modern humans. In this sense prehistory provides arguments supporting the local, Neanderthal contribution to the cultural evolution during the Middle/Upper Palaeolithic transition.

TOWARDS A UNIFIED FIELD THEORY OF HUMAN BEHAVIOR – GLOBAL CULTURAL EVOLUTION

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This paper develops a new structural psychology, and therein proposes a specific model for the scientific study of consciousness. The presented model uses Earth's geologic history of mass-extinction & recovery (evolutionary dynamics) in determining humanity's adaptive response (conscious and non-conscious traits). It argues humanity adaptively mirrors Earth's basic evolutionary dynamics, in a “mythologizing of natural adversity” as foundation for all human knowledge - a process that continues well into the modern era. The intellectual lineage used to develop this model includes:

- Evolutionary biology offers a context for this study - answering Chalmers' “hard question,”
- Paleoanthropology defines the circumstance of human emergence from Gaia,
- Environmental forces on a dexterous neurophysiology derive an ambiguous but instructive narrative logic (mythic sensibility),
- Psychology tracks humanity's shift from animal-self to modern creative-self, using work of Hegel > Freud > Jung > Rank > Joseph Campbell > Arnold Mindell as a new structural psychology,
- Fractal geometry offers a holographic design for modeling consciousness, in a form consistent with Quantum Theory,
- Memetics presents a tool for measuring conscious traits, in a variation of the Hall-Tonna values inventory,
- Finally, Structured Opportunistic Thinking, a hybrid of NTL's T-group, and Pierce's Power Equity Group Theory, suggests a developmental methodology.

This work presents a “general hypothesizing model” of human consciousness, in attempting a science of consciousness.

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GROUP SELECTIN OR GROUP PHYSIOLOGY? FILLING IN THE GAPS OF MULTI LEVEL SELECTION THEORY TO EXPLAIN CULTURAL VARIATION

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Any acceptable theory of evolution should be able to account for the behavior of all of nature, including that of human societies. Multi-level selection theory promises to do this, but has only begun to address the different mechanisms involved in the construction of the biological hierarchy. Elucidating these mechanisms will be important for the study of cultural variation, which currently conflates adaptation due to natural selection with physiological acclimation due to learning and other flexible responses to environmental variation. Just as selection operates at multiple levels of the biological hierarchy, so too does physiological acclimation, making social group physiology important to study alongside group selection. Bringing this biological distinction to the study of human culture, I show how the apparently discordant human behavioral sciences are reconciled by a rich account of multi-level evolution.

ON THE ORIGIN OF CULTURAL INHERITANCE, CUMULATIVE CULTURAL PROCESSES AND CULTURAL DIVERSIFICATION: SELF-ORGANIZATION, NOVELTY AND ADAPTATION IN GROUP FORAGERS LEARNING WHAT TO EAT

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There is a strong parallel between cultural processes and Darwinian evolution: (i) inheritance of information over generations, (ii) generation of new levels of unity and their diversification, and (iii) accumulation and complexification of information and behavior through cumulative processes. The origin of culture was long considered a fundamental prerequisite for the evolution of man. We now know other animals also display cultural phenomena, albeit at a less extensive scale. For some, the question of the nonhuman-human cultural divide now focuses on the impact of social learning cognitive abilities. We focus on the origin of cultural inheritance in a likely evolutionary context: learning what to eat in group foragers. Using a single computational simulation framework we show: (i) how traditional inheritance and cumulative cultural improvement in diet arise as side-effects of grouping, (ii) how the impact of 'active copying' depends on underlying self-organized social influences on learning as shaped by the environment, and (iii) that diet cultures differentiate as they adapt to changes in the environment, especially if they live sympatrically and compete for resources. The latter suggests a type of culturally mediated character displacement. Our results emphasize the role of self-organizing processes in generating novelty in the evolutionary process (the origin of culture) and suggests that the evolution of more complex cumulative cultural processes should be sought in how sophisticated cognition and structuring of the environment feed into simple cumulative processes that arise spontaneously.

THE ROLE OF SPATIAL SYMMETRY IN EVOLUTION

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The aim of this article is to outline the role of space symmetry rupture in evolution and to advance a plausible thermodynamic explanation to the underlying evolutionary pattern. It will be initially illustrated the evolution of symmetry in biology, since early prokaryotic cells to vertebrates. It will be described how a change of the symmetry of the structure can be seen as a change in the space symmetry of some interacting particles, embedded in a network. As an example, it will be shown how allometric scaling in living networks display an optimal transport network, conditional to spatial constraints and it will also be shown how network topology can be linked to spatial symmetry. The underlying evolutionary pattern is then analyzed. This evolutionary pattern here advocated, relies on the hypothesis that thermodynamic evolutionary systems are characterized by an ever growing influx of energy driven into the system by self-catalytic processes that must find their way through the constraints of the system. The system initially disposes of the energy by expanding, in extent and in the number of components, up to saturation due to inner or outer constraints. The two counteractive forces, constraints and growing energy flux, expose the system to new gradients. Every new (spatial) gradient upon the system represents a symmetry rupture in the components' space. By exploring a new gradient, the system imposes further restrictions on its components and increases its overall degree of freedom. The counteractive effects of reduction/increase of degree of freedom concern two different hierarchical levels and occur at two different space and time scales. Furthermore, the two opposite tendencies turn into two reverse symmetry configurations: on the one hand the space becomes less symmetrical, on the other hand the system increases in symmetry.

DARWIN IN THE EXPERIMENTAL LAB: BETWEEN AND WITHIN GROUP COMPETITION EFFECTS ON HUMAN BEHAVIOR

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This paper exploits a novel set of experimental data, collected by the author, regarding pro-social behavior in six Latin American capital cities to explore the conditions that favor the evolutionary stability of cooperative outcomes in a public goods game and other social dilemmas. The theoretical framework is a cultural evolution model based on Darwin's suggestion that "*the social and moral qualities would tend slowly to advance and be diffused throughout the world*" (Darwin, 2004 [1871] DOM: 110) through a process of group competition. Multilevel selection models using the Price equation (Price, 1970 S&C Nature) have clarified Darwin's reasoning and vindicated his insight (Bowles, 2006 Science). In the version of the model used here (Bowles, 2004 Mic), individuals with higher payoffs are more likely to be copied and characterize the

survival of pro social behavior as an individual characteristic that confers benefits to the group and which depends on the competitive pressures operating at both the individual level and at higher group levels.

For the first time (to my knowledge), the Price equation is estimated empirically using a real data set on human decisions, namely, experimental data for representative samples of urban individuals making up 150 independent groups (25 groups for each city) with an average size of 20 people. The average payoff to altruists is lower than the average payoff to non altruists in the population as a whole, and groups with a higher proportion of altruists have higher payoffs. However, the sum of the between and within-group effects on the evolution of altruism is negative. This may be either because altruism is in the process of being eliminated or because altruism is sustained in the population by some other means than a payoff monotonic updating.

The aim of this paper is twofold. First, we examine whether there is within and between-group heterogeneity in the fraction of pro-social behavior among groups in order to implement the Price equation, with which we obtain the between and within group effects that determine the cultural selection process. Second, we identify the conditions under which pro-social behavior would be more likely to spread and we describe the expected dynamics. In addition, we present further analysis by looking at other group-beneficial traits such as attitudes towards discrimination, work ethic and social values.

ON THE PHYLOGENY OF ALTRUISTIC PUNISHMENT

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Recent attention in the evolutionary theory of human cooperation has focused on 'strong reciprocity', a novel strategy proposed as researchers increasingly became convinced of the limits of direct reciprocity to sustain human cooperation in large groups (Kim and Walker 1984; Axelrod 1986; Boyd and Richerson 1992; Sober and Wilson 1998; Gintis 2000; Fehr and Gächter 2000, 2002; Boyd et alia 2003; Henrich et alia 2006). Experimental as well as theoretical work shows the decay of cooperation through reciprocation in the iterated n-person PD or public goods game, whereas punishment is able to sustain it. Fehr and Gächter (2000) proved in public goods experiments with one-shot interactions that punishment is exercised even when it is necessarily altruistic. They concluded that altruistic punishment is the core component of strong reciprocity. But simulations running through many generations have revealed that altruistic punishment is vulnerable to second order free riders. Cooperators that free ride on the punishment of others take over the population of punishers, after which defectors invade and take over. For this reason, some researchers still look for a solution to the provision of public goods that will not generate a second order free rider problem. Of the several ideas that have been proposed (Milinski 2002; Panchanathan and Boyd 2004; Hauert et al . 2007; O'Gorman et al. 2009), I here explore a variant of the single punisher or leader view, proposed by O'Gorman et al. as a mechanism that can avoid the second order free rider problem and conveniently connects to our "primate heritage", for most of our closest relatives live in hierarchical societies. Leaders in human societies

enjoy status benefits and are supported by societal bases that protect them from retaliation, if they only use punishing power fairly. Since leadership and fairness are complex social institutions, I propose an earlier phylogenetic stage to leadership, a simpler model that also serves the purpose of solving the second order free rider problem. In this earlier phylogenetic stage, punishment is carried out by the dominant to enforce cooperation and it is not constrained by fairness. I describe and explore the prospects of such a model.

SOCIAL NORMS AND INTERPERSONAL TRUST

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Because it neither implies nor is it implied by cooperation, interpersonal trust is modelled as a recurrent Stag hunt game, played adaptively by boundedly rational agents who lack mutual knowledge of each other's trust stance, and not as cooperation in a Prisoners' Dilemma. This paper argues that even though equilibrium is unlikely in such a game, agents indeed tend to converge on either of the game's two pure strategy Nash equilibria, corresponding to high trust and low trust norms. Medium trust, which is the mixed strategy equilibrium, is not a norm because it is unstable. A collapse of trust in medium trust countries is prevented by exogenous forces, probably institutions. Multiple equilibria explain both the local conformity and the global diversity of trust decisions. Most countries tend to be low trust in the long run because the low trust norm is *stochastically stable*.

TRUST, INTROSPECTION, AND MARKET PARTICIPATION: AN EVOLUTIONARY APPROACH

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We build a model where introspection matters -- i.e., people rationally form expectations about others using the lens of their own attitudes. Since trustworthy individuals are more "optimistic" about people than opportunists, they are less afraid to engage in market-based exchanges, where they may be vulnerable to opportunistic behavior. Within this context, we use an indirect evolutionary approach to endogenize preferences for trustworthiness. In some cases, the material rewards from greater market participation may outweigh the material disadvantages from foregoing lucrative expropriation opportunities. This implies that trustworthiness may be evolutionary stable in the long-term. Although stricter enforcement (that limits the scope for opportunistic behavior) does in some cases favor the spreading of preferences for trustworthy behavior (crowding in) we show that the opposite (crowding out) may also occur. Our findings are consistent with recent empirical evidence.

FATHER–OFFSPRING RESEMBLANCE PREDICTS PATERNAL INVESTMENT IN HUMANS

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In species in which paternal care of offspring is important but paternity is uncertain, evolutionary theory suggests that kin recognition mechanisms (e.g. phenotype matching) should evolve. Fathers are expected to discriminate between their children and others' on the basis of phenotypic similarities, and they should allocate resources accordingly. However, studies showing that males assess paternity by phenotype matching are rare. In a polygynous human population of rural Senegal, we examined the relationships between (1) actual father–child resemblance through both the facial and the olfactory phenotypes; (2) fathers' investment of resources in each child; and (3) child nutritional condition. We found that paternal investment was positively related to both face and odour similarities between fathers and children. Additionally, such discriminative paternal investment was linked to the children's health: children who received more investment had better growth and nutritional status. This is the first evidence that paternal investment is associated with father–child resemblance in real human families, and, furthermore, that these discrepancies in paternal investment result in differences in fitness-related traits in children.

ECONOMICS AND COOPERATION DYNAMICS IN FREE-RANGING VERVET MONKEYS

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To test whether cooperation has evolved according to economics laws, we induced cooperative behaviour in a highly social model species, wild vervet monkeys, in South Africa. In order to access small quantities of food, three groups of vervets were trained to feed from automated feeders over a period of three years. Food was dispensed only to couples or more individuals that operated the feeders together, hence showing cooperative behaviour by overcoming monopolisation of the feeders and accepting their adjacent distance in space. With time, we found that preferred combinations of individuals cooperated for accessing food matching determined dominance, sexual and kinship relationships. In addition, we are testing to see if the cooperation task brought about trading-like exchanges of commodities, as if the monkeys were spontaneously conforming to microeconomics laws. We hypothesize that behavioural commodities such as grooming, playing, tolerance and conversely aggressive displays around the feeders should have been exchanged distinctly across cooperators.

BEHAVIOURAL EVOLUTION: BEGGING STRATEGY OF THE ANDEAN DOGS

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The strategy by which Andean dogs beg for bread is described. Notwithstanding their attitude to form packs, in the height of an Andean road dogs sit lonely in the external part of the road's bend where vehicles must slow down and the probabilities of being seen and receiving morsels of bread are best. Considering this choice correct, the percentages were 81.2% ($P < 0.01$) among dogs and only 63.6% (NS) among humans in comparison with erred locations. Also the comparison of scores (1.48 and 0.86 for dogs and men respectively) was highly significant ($P < 0.001$). Two similar cases are quoted by not scientific literature confirming the evidence of the studied phenomenon.

THE CAVE AND THE SPACECRAFT. STABILITY AND MUTATION IN TWO VISUAL ARTEFACTS.

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The cave and the spacecraft. Stability and mutation in two visual artefacts. The goal of this paper is the verification of hypothesis of cultural evolution in a specific, defined and circumscribed cultural trait: the visual representation of the human body. To make this I compare two visual artefacts in which the human body is represented; these two artefacts have been chosen because they can be considered like temporarily extreme points of a representative line and for their peculiar specificity that renders them paradigmatic us of their techno-symbolic contexts. The first one is parietal graffiti of Addaura's cave (Monte Pellegrino, Palermo). This artefact, dating back to approximately 10.000 B.P., is recorded in the epigravettian period of frequentation of the cave, but according to other interpretations the graffiti date back to 7000 b.p. in a post-paleolithic period of the cave. In this paintings are represented a group of men in profile or else three-quarters view. The second artefact is a gold anodized alluminium plaque placed on board of spacecraft Pioneer 10 (launch 1972 March 3) and Pioneer 11 (launch 1973 April 6) launched from Cape Canaveral towards the deep space. The plaques show the nude figures of a human male and female along with several symbols that are designed to provide information about the origin of the spacecraft. Both the artefacts are realized with the same technique representative: the body is engraved like a silhouette. Therefore the two artefacts are compared for the same specific features : A) form of the figuration B) style, technology and the production of visual artefact C) relation between technology, material culture and figuration. Each point is a mixed of continuous elements and of mutation. Evidently the visual human body representation is not developed only with the silhouette technique; in order to simplify we can say that two are others: one form more and more realistic figuration and one sintetic-symbolic form. Both have been realized in 3D and 2D artefacts. I have chosen the case of silhouette to focus attention over a small and defined cultural trait; that trait (to make silhouette of human body) is determined by the relation between technique and symbolic

expression; so it is possible to value the mutation and the stability in this fundamental and basic relation. I intend with this paper to make a little contribution to the scientific understanding to the cultural form of life. By this I do not mean to joint a Darwinian anthropology but I want only to verify a specific form of mutation or stability in production of symbolic artefacts. However the theoretical frame of reference is constituted from the wide critical debate on anthropology after Darwin theory.

THE CULTURE OF LAST NEANDERTHALS IN THE SOUTHERN ITALY: EVOLUTION OR ACCULTURATION?

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The period between 40.000 and 28.000 years ago in Europe (comprised in oxygen isotope stage MIS 3) is widely debated by scholars in prehistory: extinction of Neanderthals, an autochthonous population, progressively replaced by anatomically modern humans during the expansion from the Southeast to the West. Attempt to collect dynamics of this phenomena implicates the deep knowledge of biological and cultural processes of these ancient populations on the basis of their adaptive capacities and possibilities to change the environment and consequently to exploit the resources according to not only palaeoclimatic but also geographical-altitudinal conditions. An element of competition (direct, indirect?) between the different populations coexisting for a long time, with probable impact on various demographic and cultural aspects had to interact as well with the previously mentioned factors. The aim of our research is to discuss characters and possible contacts among the last culture of Neanderthals, the Uluzzian (defined in 1963 by A. Palma di Cesnola) and the Aurignacian. We start with a brief analysis of changing palaeoenvironmental conditions in Southern Italy during late MIS 3 (final Mousterian – Uluzzian and the Early Upper Palaeolithic). Exclusively sites with mentioned cultures present in stratigraphical sequence (Poggio and Oscurusciuto shelter; Castelcivita, Cavallo, Paglicci and Cala caves) were considered for this research. We present the following data mostly unpublished: the composition of the hunted fauna and the carcasses exploitation strategies; the technological and typological characters of the lithic and bone industry and the presence of ornaments. We conclude with an assessment of changing subsistence strategies, raw material exploitation and land-use during late MIS 3 together with palaeoenvironmental variations considering both the chronological time span and assorted geography of the Italian peninsula.

PHASE TRANSITION IN THE DYNAMICS OF OPINIONS TAKING PLACE ON NOVEL TYPES OF SOCIAL NETWORKS

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An outstanding open problem in social science is whether cultural heterogeneity can persist globally, despite the tendency of similar traits to further converge locally through human interactions. Theoretical models indicate that this crucially depends on two factors: the topology of the underlying social network and the overlap of traits in cultural space, which determines the “cultural channels” allowing mutual influence. However, while several studies have documented the empirical properties of social networks, little is known about the large-scale organization of cultural traits in real societies. This prevents our understanding of the pervasive dynamics of opinions mediated by novel electronic platforms (such as online forums and blogs) where people who share common interests but do not necessarily know each other interact, and cultural channels dominate over “traditional” social ties. Here we bridge this gap and use a large dataset to represent the scientific cultural traits of thousands of Europeans. This allows us to simulate the dynamics of opinions and culture in novel types of social networks sampled from the real world. We show that the fate of diversity is crucially determined by cultural openness, representing the range of mutual influence between individuals. At a critical openness value, which represents a novel measure of cultural heterogeneity, a symmetry-breaking phase transition between a potentially homogeneous and a heterogeneous society occurs. The nontrivial structure of cultural traits, insofar ignored in theoretical studies, strongly affects the critical threshold and implies that the openness required for cultural convergence is much lower than expected under the usual model hypotheses.

STATISTICAL PHYSICS FOR BIOLOGICAL NETWORKS

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Ten years ago, the pioneeristic work of Barabasi, Watts, Vespignani et al. pointed out the novel concept of “complex network”: from then on, the study of networks has rapidly increased across various disciplines. Different kinds of systems share the property to be interconnected structures, obeying organization principles not at all “casual”. Biology and social physics provide a number of very interesting examples of such structures: neural networks, food chains, metabolic and proteic webs are only few examples. On the other hand, statistical physics provides a number of tools to describe and analyse them. Here we present a variety of networks whose analysis is directed to answer the question “is this a random network?”. To answer this question, randomized graph ensembles that preserve only local topological properties of a real network should always be used as the simplest null models. Here, we propose an exact and fast method that allows to obtain expectation values analytically and works for any directed or undirected network. Remarkably, after a

fast preliminary parameter estimation, the time required to obtain exact averages of any property over the whole graph ensemble is the same as that required to compute the same property on the single original network, as it is not necessary to sample the configuration space explicitly. We show that, when applied to real biological networks, our method provides a novel and easy way to detect nontrivial patterns such as correlations, clustering and motifs.

THE ROLE OF SOCIALITY IN ANTIPARASITIC DEFENSE

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Innate immunity in Insects appears nowadays more complicated than ever thought. The defence reaction against pathogens and parasites may be influenced by multiple variables interacting reciprocally, such as feeding behaviour, ageing, energy use, circadian rhythm and reproduction. In social insects like bees, ants, termites and wasps, sociality is an additional variable that play a pivotal role in immune defence. It consists of a series of prophylactic behaviours adopted by the single members of a colony, which produce a unique synergistic effect against the undesired intruder: this outcome is known as “social immunity”. In an evolutionary frame, it is possible that such an adaptation has led to a decrease of some cellular and humoral responses available to the single individual. As a testament to this, evidences for a reduction in the immune genes repertoire have been found in honey bees, as compared to fruit flies and mosquitoes.

In this triggering perspective we explore the immune interactions within a peculiar host-parasite system, where the host is a social paper wasp and the parasite a strepsipteran insect. The long term coexistence of the two organisms, which is probably maintained by both the low virulence of the parasite and the high tolerance of the host, is susceptible of interesting considerations about the mechanism of reciprocal adaptations. We focused on the effect of parasitization on the host cellular and humoral responses (hemocyte counts, phagocytosis and antimicrobial peptides) and we looked at the immune dynamics during co-infection with both the parasite and pathogenic bacteria.

EVOLUTIONARY MODELS AND SOCIOLINGUISTICS, THE EXAMPLE OF THE VITIAZ STRAIGHT TRADE JARGON

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Evolutionary models have been employed in several areas of the study of culture and language in the past two decades. The use of evolutionary models is naturally found in sociolinguistics and in the study of the origins of language, but traditionally only in a reductive and metaphorical way. The development of generalized theories of evolutionary change (Dawkins and Hull) has spawned models of language change on the basis of such generalized theories. Salikoko S. Mufwene developed an evolutionary model for language

change that represents languages as a species, following the parasite-host model, and focuses on ecological framework, insisting that languages are embedded in a socio-cultural environment.

The present paper wants to analyze a now extinct contact language, the Vitiaz Straight Trade Jargon (Papua New Guinea). This paper wants to show how using the Mufwene model it is the best way to defining the linguistic change in this region based on the historical, ethnographic and linguistic data available. The relevance in doing it is not just to test the model in a new case of study, but also so is to stress the model in a case where the usual variables are hidden or main functions apparently reversed.

EVOLUTION, CONFLICT AND PANDEMIES

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Health is considered the condition in which man is feeling well and develops his life potential in his biological and social environment. As life, even diseases are the result of continuous change. They are a factor of natural selection in the wild life and they play a role in the evolutionary process.

Illness can be taken into consideration as a sign of the conflict between different dimensions of life, internal ones (physiological, biochemical, psychological) as well external ones (environment, resources, society). Infectious diseases are interpreted as the "fight" between the human body and microorganisms. Starvation is the result of the conflict between the biological need for nutrition and access to food. Other diseases are influenced by the conflict between human needs and the environment, in the sense of scarcity of resources and roughness of the natural conditions and events. Disease and illness can be an alarm bell, the indication of the exhaustion of the capacity of adaptation and resistance of individuals and groups to the external conditions.

The technological civilization has built significant protections to the threats of nature and has brought benefits to a big number of people. Medical science has achieved responses to many types of sufferings, sometimes resolutives and sometimes lenitives ones. The number of sick people, of chronic diseases and of living subjects in general has grown in the global society. Therefore modern successes have evidenced new problems and need new goals.

If the reduction of subjects of a species represents a risk for its survival, too big populations seem to overcharge the ecological niches in which they are included. Victims of hunger and inanition are, for some researchers, the price that every species has to pay in order to keep the population at the maximum levels of the demographic expansion. Diseases as well, in the phase of evolutionary stress, intervene to set the dimension of the population again under the maximum threshold. Can the fear of the explosion of a pandemy be due to this underlying awareness?

Moreover human interventions have produced a series of microtransformations of the environment which bring instability in the ecological balance and in the relation mankind-nature. Our "collective handling" has produced different neglected fall-out which now summing, are threatening some conquests.

Which can be the overall sense of this development? Which are the resistances and interferences to the caution in the growth? Which role is the conflict between different interests, ideas and basic emotions playing in the further development of the civilization and can we consider some of them counterproductive for the collective balance? At last is a "therapy" in form of a reasonable adaptation necessary and still possible?