

International Conference
Our Species and Its Responsibilities.
An Ontology for the Environmental Crisis
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Booklet of Abstracts



Car il y a une espèce de force de génie & de courage d'esprit à pouvoir envisager, sans s'étonner, la Nature dans la multitude innombrable de ses productions, & à se croire capable de les comprendre & de les comparer ; il y a une espèce de goût à les aimer, plus grand que le goût qui n'a pour but que des objets particuliers ; & l'on peut dire que l'amour de l'étude de la Nature suppose dans l'esprit deux qualités qui paroissent opposées, les grandes vûes d'un génie ardent qui embrasse tout d'un coup d'œil, & les petites attentions d'un instinct laborieux qui ne s'attache qu'à un seul point.

(Buffon, *Histoire Naturelle*, Premier Discours)

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Tiziana ANDINA (Keynote address)

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Transgenerational actions and responsibility toward our species

Should we be considered responsible (and if so, why) towards the species we belong to, in addition of being responsible for ourselves? Typically, the answers that are offered to this and similar questions, make reference to arguments based, alternatively, on the idea that things we have to care of are valuable for us, people like us, or *per se*. This paper develops a different perspective, based on the idea that in a lot of cases the responsibility is an obligation due not to the kind of value certain things are supposed to have, but rather to the *type of actions* that social people and institutions generally perform. Starting the discussion from the classical paper published in *Science* by the American biologist Garrett Hardin and titled "The Tragedy of Commons" (1968), on the difficulty of responsibly managing the so-called "commons", i.e. the cultural and natural resources accessible to all members of a society, I will discuss a particular class of actions, which are peculiar to the functioning of complex societies. After discussing the metaphysical model of these actions, which I call "transgenerational", I will show the reason why transgenerational actions necessarily imply responsibility of one generation to the other. In a word, they require responsibility between generations and hence a particular sensitivity to the future.

Franco ANDREONE

MRSN Museo Regionale di Scienze Naturali

Wildlife and socio-economic depletion in a biodiversity hotspot: Madagascar as a study case for a global engagement

The widespread biodiversity depletion and parallel habitat alteration and destruction which interest large sectors of our planet represent epiphanic steps in the almost ineluctable erosive process carried by humanity, individually and/or as a species. Here, I present my experience and opinions as a zoologist and conservationist working in Madagascar since more than 25 years. This island is a paradigmatic land, home of an exceptional biodiversity and country of a suffering human population. Since its independence from France in 1960 Madagascar became one of the few countries in the World experiencing a dramatic and constant impoverishment, marked by periodical political-economic crises, accompanied by deforestation, defaunation, epidemic recrudescence, cultural loss and economical erosion. At the same time, Madagascar is one of the most important biodiversity hotspots, as identified by Norman Myers. The need for a better knowledge and discovery of Madagascar's wildlife and conservation priorities conflicts with the urgency of warranting better human conditions. A poor population (governed by an oligarchic ruling class) featured by a mean daily income of < 2 dollars, badly matches with the necessity of protecting and preserving unique wildlife, biomes and landscapes. These actions are generally perceived as separated, unconnected and opposed by ethnic groups, who also largely ignore the ecological tragedy towards which they are running. A main step-stones in this urgency is finding an ecoeconomical equilibrium: here I refer about the case-study of amphibian biodiversity and rosewood illegal exploitation. Malagasy frogs, with more than 350 endemic species represent roughly the 5% of the World amphibian fauna, but are considered of no interest by local people since they do not have an immediate and recognizable economic value (excepting for specialized ecotourists). Conservation activities currently carried out within the frame of the so-called

“Sahonagasy Action Plan” are difficult to be made perennial (Andreone et al., 2016). At the same time, the “bois de rose” or palissander (genus *Dalbergia*) was subject to an intense and illegal trade, which affect great part of the pristine northern and eastern forests (Schuurman & Lowry, 2009). The interaction between commercial trade and politics led to the emergence of a powerful environmental mafia, which nowadays pervades all the social classes and influences the political events, including elections. Recent studies showed that the major political crises were mirrored by increases in the trade and exploitation of rosewood. Similarly, land grabbing produced a disentangled relationship between traditions and local beliefs and the need for modernization, with acritical loss of traditional taboos (“fadys” and “dinas”). The prevision for the future of Madagascar is quite somber and shows how individual and class interests are prevalent over the humanitarian and planetary rights. Interactions of western organizations, although partly positive, are far to produce the expected results: in pursuing E.O. Wilson’s “half-earth vision” it is crucial to develop a new deal between man and nature, where the wealthiest countries become more directly responsible for the management of far and poorer countries, often seen as paradise lands (for holidays) but rarely perceived as World heritages.

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Sandro BERTOLINO

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Not to choose is not an option: we can only direct our actions, which exist anyhow

Homo sapiens is the only species that has gained the power to destroy the world, including its biodiversity. We can do with species and habitats as we wish; It is our choice. We are not, therefore, just another species going about its business in the greater evolutionary scheme of things. In our power, we are qualitatively different from all other organisms. However, the possibility of choosing also implies the need of choosing. Or, in another way, we are condemned to choose. We are the main driver of the global changes characterizing this era. Our actions change the composition and functionality of ecosystems, generally worsening their quality. We could choose to try to reverse this trend, or not. However, the option to continue the ‘business as usual’ is still a choice, because we will continue to lose biodiversity. The introduction of alien species, i.e. the willful or inadvertent movement of species outside their native range, is nowadays considered one of the major threats to biodiversity and an important driver of ecosystem changes. Since there is no sign of saturation in the increase in numbers of introduced species, the impacts they produce will probably further increase in the future. A global strategy aimed at reversing this trend should be based on the prevention of new introductions, the implementation of an early warning and rapid response system, and the eradication or control of established populations. All these actions interfere with human activities. For example, one of the main pathways of introduction is the trade of animal and plant species, as pets, for aquaria or gardening. To limit the release and establishment of new species, a trade ban of some species is therefore necessary, with an obvious limit to the concept of free trade. The eradication of harmful populations is a key conservation tool to mitigate the impacts

caused by established invasive species. This action, however, involves the suppression of animals, an action supported by the scientific community but difficult to be accepted by part of the society. Rats involuntarily introduced on islands through our boats could predate every single egg or fledgling of ground-nesting birds. The rats are already there, brought by us; we could choose to eradicate them, and let the birds reproduce, or on the contrary let the rats eradicate the birds. In the same way, American grey squirrels, brought to Italy by humans for their pleasure, are replacing the native Eurasian red squirrels. We can decide to remove the greys or let the reds go extinct. Doing nothing is not neutral, it is a choice.

Francesca DE VECCHI

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Qualitative social ontology and the problem of the ontological status of both natural and social entities

In my talk, I would like to focus on the connections between the idea of a qualitative social ontology, on the one hand, and the idea of an ontology for the environmental crisis, on the other hand. I will inquiry into such connections in working on two aspects: the very idea of qualitative social ontology and the ontological status of both natural and social entities.

(i) The very idea of qualitative social ontology

In talking about “qualitative social ontology”, I deal with the fact that social entities not only can exist or not exist but also be more or less achieved and liable to degrees of existence, and the fact that social entities can be bearers of varieties of ways of existence, that is, there are several ways in which a social entity of a certain type can be realized. In accordance with phenomenological eidetics, I will show that modifications of essential connections involve lacks or variations of essential parts of entities which respectively imply degrees of existence and variety of ways of existence which “enhance” the existence, and I argue that the modifications issue hits the core of the quality of existence issue (Husserl 1901, Reinach 1913, Author 2016). I will suggest that such idea both of variations and lack of essential parts of an entity is very fruitful for thinking the very problem of biodiversity of species.

(ii) The ontological status of natural entities and social entities

Unlike Searle’s thesis on a clear-cut distinction between social facts and brute or natural facts (Searle 2010) and also unlike Ferraris’ thesis on a neat distinction between social entities and natural entities (and also ideal entities) (Ferraris 2009), I argue that bounds between natural entities and social entities are much more vague and ambiguous. Therefore, unlike Searle and Ferraris, I just limit myself to maintain that we can certainly affirm that social entities existentially depend on human beings’ intentionality, but, on the other hand, we cannot affirm that natural entities are definitely entities which are existentially independent from human beings’ intentionality; human activities modify, in a positive or negative way, the existence of natural entities (natural landscape, dogs races, fruits species etc.) and very often damage and destroy natural entities (e.g. habitat interruption, pollution, overexploitation of natural resources). In conclusion, in my proposal I would like to show that in order for an ontology for the environmental crisis to be developed, it is needed that social ontologists account for a qualitative social ontology which deals with the problems of degrees of existence and of varieties of ways of existence, not only of social entities but also of natural entities whose existence and maintenance in existence is constantly influenced by human beings’ intentionality. Finally, in order to capture the relation between human beings and both natural and social entities, the

very concept of human beings' intentionality has to be taken in charge by a qualitative social ontology; more precisely, qualitative social ontology should address the issue whether, in such a global perspective, it still make sense to speak of human beings' intentionality in terms of "plural subject" (Gilbert 2014) and "group agency" (List-Pettit 2011), or in terms of human beings' complicity (Kutz 2000), or, rather, other and new socially ontological categories should be found and developed.

Alvise LUCARDA, Cecilia MUGNAI

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Evolution of the concept of wildlife conservation: new indications from the fishing planet and from the recent changes in distribution of freshwater fish species

In freshwater fish species, geographic isolation between populations inhabiting different rivers, determined the reduction of gene flow and led to speciation or differentiation in ecotypes with the increase of natural biodiversity. An emblematic case is represented by the Po river basin and the North Adriatic river system, where in the last 15000 years, a lot of endemisms have been created, such as *Acipenser naccarii*, *Salmo carpio*, *Barbus plebejus* and *Salmo marmoratus*. Since many centuries, freshwater fishing played an important role in human communities, formerly as a primary source of nutrition, later as professional jobs, and recently, almost exclusively as recreational activity and sporting. This contributed to develop of an economically important business, and the increasing number of anglers, with their vote at the polls, also acquired a strong political influence. The heaviest impact on native freshwater fish populations is due to overfishing, but negative impacts also comes from general over exploitation of fresh water resources such as water pollution and waters subtraction for productive uses. Rivers artificialization and the business of fish restocking also plays a relevant negative influence, but the greatest damage are consequences from the introduction of invasive alien species, determining the extinction, or the hybridization in an unrecovery way, of several autochthonous forms. This represents an urgent conservation problem because of the loss of biodiversity and the phenomenon will be summarized by a brief presentation of past and recent species distribution, but also by the detection of hybrid phenotypes and finally by population genetic data, collected in the last decades for the specie *Salmo marmoratus*. The regulations of the European Community are very clear in this regard and prohibit the introduction of alien species, but anglers' associations and the fishing business are opposed, even promoting a deviated "no kill" practice called "ethical fishing" which promote the release of alien species in the rivers after they are captured. Birds and mammals are emotionally preferred by humans because of their behavior, fur, sounds and colors. Fishes are less known, and similarly to reptiles are emotionally unpleasant for most of the common people. Amateurish anglers are the only reserving some interest in freshwater fauna and management, but they can do it only from anthropocentric and recreational points of view, considering the primary interests of the sport of fishing before any conservative purposes. Emotionality prevails over rationality, the interests of the fishing planet prevail over naturalistic and social issues, the freshwater natural resource should be managed by technicians but is actually managed by those who use it for amusement. With the passing of generations, historical memory and knowledge of the extinct freshwater species are lost or preserved only by the few experts in ichthyology and conservation. Scientists and naturalists should be more involved in the dissemination of fauna conservation principles, but this activity and conservation management increase social costs, and public administrators are under severe political pressure. Time is passing and

hybridization or the extinction of native species are irreversible processes as the expansion of invasive species. Is it an inevitable destiny inherent in evolutionary processes of our species or there is enough time for to grow up a social ethic responsibility that can stop environment destructive processes? Protected areas and sanctuaries could represent the only viable way for the freshwater fauna conservation, but following this solution will be lost the chance to promote any collective human responsibility that can work as a moral agent, for the fauna and environment conservation choices in the future.

Livia LUZZATTO

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Personhood and climate change: responsibilities towards future generations

Time sensitive, intergenerational environmental crises like climate change are forcing us to quickly reassess who the bearers of moral rights and duties are – across present and future generations alike. Yet species membership seems to be the wrong locus of moral responsibility: what it says about agents – the information it gives about their genotype – is morally irrelevant. I argue that in attributing moral responsibilities we should instead shift our focus onto an analysis of agents' actual interests and capacities. I propose that moral agents are most accurately described by an account of personhood, where a person is defined as someone who i) has a general and sufficiently strong interest in participating in a system of moral cooperation, ii) has substantive interests sufficient to warrant protection via moral rights, and iii) has the capacity to fulfil her moral duties under a system of moral cooperation. According to this definition, personhood has both a social and a normative component. For one, it is a concept that can only exist in a system of moral cooperation between like persons: a person is only then a person if she can be recognised as such by others around her, if she can act as a person in relation to others, and if others can act as persons towards her. For another, it defines how one must act as a person within a cooperative system: most importantly, a person must respect the interests others have in upholding their personhood and exercising their capacities to live as autonomous moral beings.

The concept of personhood hence attributes both individual responsibilities and a collective duty to promote the social structures that make personhood possible. It also enables us to be more specific about what persons owe one another:

- Persons have a right to spheres of freedom within which to exercise their personhood – roughly, to live their lives as autonomous individuals – as well as to the physical goods necessary for their subsistence as beings, and consequently persons.
- All persons have a correlated duty to ensure (or, in some cases, not to obstruct) the provision of these states and goods to other persons, under the condition that this does not interfere with their own rights. In an environmental crisis like climate change, the concept of personhood can serve as straightforward tool to guide our behaviour towards future generations. It can on its own confer distinct duties – for instance mitigation duties – that do not require the duty-bearers' prior enjoyment of emission benefits, or the attribution of historical or actual responsibilities. It allows us to state that the personhood rights of future generations are severely threatened by climate change – both their autonomy-related rights, such as the right to free movement, and their subsistence rights, such as the right to food. Many present persons, on the other hand, have the capacity to limit those future right breaches – for instance through increased mitigation efforts, as well as financial and technology transfers to aid mitigation and adaptation elsewhere – without sacrificing their own personhood rights. The proposed account hence provides both a strong reason for

immediate action, as well as a robust framework for a fair distribution of the accruing duties.

Dirk MAES (Keynote address)

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Are citizen science data fit for purpose in nature conservation?

Increasingly, professional scientists are using data collected by laymen, so called “citizen scientists” in nature conservation. But, citizen science data “suffer” from a couple of biases that might hypothecate their use for scientific analyses?

1. Spatial bias: citizen scientists are free to collect data **where** they want leading to an uneven mapping intensity over the investigated region. Unlike scientifically designed projects in which randomly sampled sites are visited, citizen scientists tend to prefer more natural areas such as nature reserves instead of intensively used agricultural areas. This often results in an underestimated distribution area of species.
2. Temporal bias: people are free to collect data **when** they want leading to an uneven spread of data during a certain period. In the past, many records came from collectors who deposited their specimens in museum collection while at present, many people use smartphones to “collect” data. This results in a disproportioned number of records which complicates, for example, the calculation of a trend in abundance or distribution for Red List assessments.
3. Observer quality bias: not all citizen scientists are equally skilled leading to differences in data **quality**. Within the citizen scientist community, classification skills can range from beginners to highly-trained experts. This can lead to misclassifications of species and, therefore, the inclusion of erroneous data in the data set.

Can these biases be overcome to make citizen scientist data usable for scientific purposes? Yes, they can! I will illustrate how we can deal with these biases using some examples from Belgium. The conclusion of these examples is that citizen science data are very valuable for nature conservation and that scientists analysing such data need to, when necessary, correct for the abovementioned biases.

Virginie MARIS (Keynote address)

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Another “Great Divide” - Rethinking wild nature in a human-dominated world

In my presentation, I will defend the necessity to rehabilitate the “great divide” between nature and culture. A common analysis of the present environmental crisis roots it in the dualist worldview inherited from Modernity. The so-called “Great Divide” between culture and nature is considered as a cogent explanation for the destruction of natural habitats and species and the overexploitation of natural resources. However, rather than the separation itself, these destructive patterns of contemporary societies may lie in the hierarchy between humans and non-humans much more than in the recognition of separate realms between culture and nature. First, following Frédéric Neyrat (2016), I will question the strength of the supposed modern dualism. The central argument is that modernity is not characterized by a truly naturalistic ontology in the sense given to this concept by Descola (2005). Rather, the modern worldview and ideal represent a form of anaturalism, which denies the proper existence and properties of nature, or at least which tends to annihilate nature

much more than dividing it from humans and human artifacts. Then I will offer a conception of the culture-nature couple that rehabilitated the epistemic and normative strength to the reference of wild nature. This new form of dualism will not be one of contempt and domination but rather one of recognition and respect for nature, considered in its radical otherness. This will lead to defend in a third section a new sense of the "great divide", not (or not only) as a "great separation" but above all as a "great redistribution" of space, resources and moral concern, admitting that humans are grabbing far more than their fair share.

Sebastian MUDERS

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Two kinds of human dignity?

My paper is concerned with human dignity, the value that is most frequently cited to justify a normative gap between human beings and other animals. One important issue within the debate on human dignity concerns the range of its bearers: what are the dignity-conferring properties that control our ascription of human dignity? On the one hand, one of the "truisms" of human dignity seems to require that at least the vast majority of human beings need to have this value (cf. e.g. Zylberman 2016). On the other hand, it seems hard to find a property that is a) shared by all (or most) human beings; b) has normative significance; and c) justifies our talk of human dignity as a special value that has priority over the intrinsic worth of other living beings.

One prominent attempt to solve this problem is by introducing different kinds of dignity applicable to human beings (cf. FitzPatrick 2004, 2017; Merkel 2002). The basic idea goes as follows. Maybe all human beings deserve a certain degree of respect simply because they are human. Still, certain human beings deserve a higher degree of respect because, in addition, they have certain capacities that grant them the even higher status of personhood. While the latter status is identified with a human dignity whose bearers are individual human beings, the former can only be ascribed to individuals insofar as they belong to a specific collective: the human species. This two-level conception of dignity can explain why certain human beings, such as human embryos, anencephalic newborns or people in a persistent vegetative state (PVS) still deserve some respect even compared to non-human animals, although they do not fulfill the standard criteria usually brought forward by theorists of human dignity, i.e. rationality, autonomy and the like. My paper examines two arguments that put the two-level conception of human dignity under pressure. The first argument highlights the point that the universality in our ascription of human dignity to its bearers is purchased by opening a significant normative gap between those human beings that enjoy rights provided by individual dignity and those that only participate in the human dignity of the human species: Whereas individual human dignity is considered as a value which defies normative trade-offs, species-bound dignity is open to all sorts of conflicting evaluative considerations. The second argument is concerned with the source of the obligations we have to follow the requirements of human dignity. The individual dignity of human beings is constituted by norms that express our direct duties towards the bearer of this status, whereas the species-bound dignity only gives rise to indirect duties we have in light of these entities (see e.g. Regan 1985: 150f.). This appears to have problematic implications: It seems wrong that the prohibition to kill embryos or people in a PVS against their will does not primarily protect them, but merely serves some abstract good or even is only meant to preserve the character of the wrongdoer. I close with a short comparison of the two-level conception of human dignity with a more classical approach, where rational nature, spelt out by a number

of “radical” capacities each individual human being possesses, is sufficient for ascribing a human being individual dignity (cf. Lee/George 2008).

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Markku OKSANEN (Keynote address)

University of Eastern Finland

Environmental crisis – can we put the blame on human(‘s) rights?

The main theme of the conference is the ontology of human species and human responsibilities for the current environmental crisis. As far as the humanity is considered as an agent capable of coordinated action, like a single actor, there are reasons for making the linkage between the species and the ascription of responsibilities to it. An expression of the established human collectivity can be found in the idea of human rights, probably the most universal moral code the humanity has ever created. This alone provides a reason for examining it in relation to the current environmental crisis. Are human rights a source of the crisis or a necessary element in attempts of finding solutions? I will examine two critical points of the human rights thinking against the assumed environmental crisis, those of (i) human exceptionalism and (ii) inability of react in a situation of an emergency. (i) Human rights are human’s rights. As standardly defined, they are rights that belong solely to human individuals because of their species membership; no other reason needs to be presented. If so, human rights can be seen as reflecting human exceptionalism, the attitude of humans to the rest of nature that justifies the human exploitation of nature. Is this reflection sensible or misleading? (ii) Environmental crisis is a situation of an emergency, and when we are in a state of an emergency, there are calls for exceptional actions and exceptional ethics. Exceptional ethics calls for suppressing some of the basic rights in the bundle of human rights. Does this argument work, or is it rather so that human rights justify or support political responses to the emergency? My aim is ultimately to defend human rights through defining human rights and specifying their role in ethical and political thinking.

Davide PALA

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Experts, good citizens, democratic public debates and global warming

Among climate experts there is an overwhelming consensus that (i) global warming is occurring, that (ii) this fact is alarming and that (iii) humans are causally responsible for it. Despite this, 16% of American citizens deny that (i) global warming is occurring, 48% of them question (ii) its seriousness, and 50% think that (iii) human activity has

no role in causing it (Anderson 2011). These discrepancies can be observed in many other countries as well. In this talk I will provide a normative framework to assess the attitude of those citizens that, like American citizens, in democratic public debates concerning the elaboration of public policies, mistrust experts, i.e. trustworthy epistemic authorities, in regard to beliefs that are justified and almost undisputed within the scientific community. I will argue that this attitude is *bad*, because citizens that show it do not possess the virtue of the epistemic trust in trustworthy epistemic authorities (ETITEA), which is demanded by the non-exhaustive ideal of the good citizens publicly debating in democratic contexts. According to this non-exhaustive ideal, as a necessary but not sufficient condition, in democratic public debates citizens trust trustworthy epistemic authorities as a way to respect themselves and each other as peers in circumstances of epistemic dependence. In more detail, I will show that the virtue of ETITEA is required by three ideas specifying the non-exhaustive ideal of the good citizens publicly debating in democratic contexts, i.e. (i) the idea of rational citizens, (ii) the idea of reasonable citizens, and (iii) the idea of responsible citizens. First, ETITEA is demanded by the idea of rational citizens (i). Rational citizens normally want to believe justified beliefs. Moreover, they want to act successfully, and know that justified beliefs lead to successful actions more than unjustified beliefs. Yet rational citizens know that in most domains, i.e. all domains in which they are not experts, they do not have first-hand evidence justifying the related beliefs, and cannot even acquire the expertise necessary to understand either the evidence or the claims relative to the evidence. In the light of this, rational citizens dismiss the idea of epistemic independence as irrational, acknowledge their epistemic dependence, and show trust in trustworthy epistemic authorities and their claims. In this way they can rationally hold beliefs in domains in which they are not experts, successfully act on their basis, and show respect to themselves. Second, ETITEA is required by the idea of reasonable citizens (ii). On the one hand, reasonable citizens respect a reciprocity constraint, therefore they restrain themselves from publicly advancing unjustified and highly sectarian beliefs, because they do not meet almost uncontroversial scientific standards and would not be endorsed by everyone. On the other, reasonable citizens accept, among the burdens of judgement, the fact of epistemic dependence on epistemic authorities as a condition that all citizens (more or less) equally share. Both features lead reasonable citizens to acknowledge the need of ETITEA as a way to respect each other as peers in circumstances of epistemic dependence. Third, ETITEA is demanded by the idea of responsible citizens (iii). Responsible citizens do not want to unduly harm others and know that public policies based on unjustified beliefs likely harm others. Also, they are aware that they cannot autonomously shape justified beliefs in those domains in which they have no direct expertise. Responsible citizens, therefore, in public debates concerning the elaboration of public policies show trust in trustworthy epistemic authorities in those domains in which they are laypersons. This is a way to respect both co-citizens and citizens of other countries. Finally, I will employ this normative framework to assess the public mistrusting attitude showed by citizens toward those trustworthy epistemic authorities addressing global warming, and argue that it is bad because it shows a lack of rationality, reasonableness, and responsibility.

Jan SPRENGER (Keynote address)

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Environmental decision-making, uncertainty and the precautionary principle

Conservation ecologists have to classify the degree to which a species is endangered and may go extinct. Such classifications are often made in difficult epistemic circumstances. Information on the number of specimen can be rare, the future impact of environmental changes (e.g., reduced habitats) are hard to assess, and so on. How can reliable estimates of risk status then be made, and how should decisions be taken? The Precautionary Principle addresses these problems: it is a famous guide for environmental policy-making under uncertainty. However, spelling it out in a coherent way that does not render it empty is far from trivial. In my talk, I explore ways to understand the Precautionary Principle in environmental policy-making: first, in the specific context of conservation ecology, and second, in a broader sense which also includes applications to climate science.

Davide VECCHI

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Organismality, not centralised control, grounds species collective responsibility

This contribution explores the issue of whether supra-organismal entities such as groups, populations or species might be considered morally responsible. I shall start from the assumption that biological entities can be considered morally responsible only if they are causal agents. The concept of agency here used is neither restricted to human agency nor broadened to include the capacities of entities to bring about changes (Schlosser 2015). Rather, it will be characterized minimally as a capacity to act in accordance to a goal (Barandiaran et al. 2009). In this sense, genomes and proteins are not causal agents while all organisms (unicellular and multicellular) are. Given that supra-organismal entities are aggregates, attributions of causal agency depend on the nature of the collective agency instantiated and on whether their behaviour is solely accountable in terms of the behaviour of their organismal constituents. Some supra-organismal aggregates seem clearly causal agents; for instance, despite being cellular aggregates, humans display two important properties: centralised control and organismality. Centralised control - opposed to distributed control - concerns the capacity of a part of the aggregate to harness the behaviour of the components; for instance, humans' choices seem to depend at least partially on a centralised capacity rather than on the behaviour and state of the individual cellular components. Many (probably all) organisms have evolved forms of centralised control. Do groups, populations and species possess centralised control? Intuitively, it seems that they do not, even though I will propose that this is insufficient to argue that they cannot be causal agents. Rather, I shall argue that, while centralised control is not necessary for causal agency, some degree of organismality is. Organismality is the achievement of "unanimity of interest" among the components of the aggregate. This property comes in degrees (Queller and Strassmann 2016). Unicellular and multicellular organisms possess a high degree of organismality. Particularly, they possess a high degree of integrative cohesion because their components appropriately interact in an extremely coordinated and organized fashion (Barker and Wilson 2010). Do groups, populations and species exhibit integrative cohesion? Part of the issue revolves around the explanation of their aggregate behaviour: should atomism, methodological individualism or holism be endorsed (Levine et al. 1992)? Consider the general case of a policing system constraining individual components' behaviour. Suppose government imposes sanctions aimed to protect endangered species or curbing carbon dioxide emissions: in this case, "collectively irresponsible"

individuals' behaviour could be constrained (e.g., individual actions could be overruled). Note that this case is structurally analogous to that in which policing systems internal to multicellular organisms constrain the behaviour of "collectively irresponsible" cells (e.g., in cancer formation). In both cases, the behaviour of the aggregate is such that "social structures" (e.g., policing systems) constrain individual components' behaviour and guide aggregate behaviour towards a certain outcome. When this happens, supra-organismal aggregates exhibit some form of organismality and, I suggest, might be considered causal agents despite lacking genuine collective agency (i.e., centralised control). However, whether this makes them morally responsible is an ethical question that goes beyond the scope of this contribution.

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Does mathematical modeling have something to say in the environmental crisis?

In this talk we plan to contribute to the discussion of this meeting by presenting four examples of misconceptions in common reasoning, trying to illustrate what implications may "natural assumptions" have even among people that are knowledgeable in the issues. The fallacies of forecasts based on this intuitive kind of reasoning will be illustrated by case studies, the first two being well-known in the literature, the third one instead constituting a very recent discovery of researchers of the University of Torino. The last one is an unforeseen, up to a couple of years ago, and alarming call on the effects of climatic changes, that may alter the primary production of oxygen. The so-called Allee effect or critical depensation, [1], is the phenomenon for which a population that is reduced below a critical threshold disappears because essentially its individuals have difficulty in finding each other to mate, due essentially to the vastity of the environment in which they live. This topic has been discussed in the literature in the context of fisheries, [1]. The phenomenon of hysteresis in life sciences, [2], is well-known. In simple words, it shows that by a continuous change in one (or more) model parameters, i.e. environmental conditions, the ecosystem has a sudden dramatic transition from a state, for instance an equilibrium in which all populations 1 are present at high values, to another one in which some of them attain extremely low levels, putting them at the verge of disappearance. This occurs when a critical threshold is crossed, even by a very small amount. The fallacy here lies in thinking that a small change of the environmental conditions in the opposite direction is enough to push the system to return to the previous state with high population values. CAEV (Caprine Arthritis Encephalitis Virus

disease) is a disease that affects goats. It is caused by a lentivirus, i.e. a virus that very slowly shows its bad effects, similar to the one causing HIV in humans. At present there is no vaccine and the eradication policy lies in removing the newborns from their infected mothers and raise them in an isolated ground by healthy mothers, [3]. Our studies reveal that this is the wrong policy, if the right conditions are present, and should instead be completely reversed, [4]. The last example concerns a problem that might develop in the ocean, where phytoplankton plays an essential role in the whole earth oxygen production, [5], the rate of which depends on water temperature. Its raising can thus significantly decrease the phytoplankton net oxygen production. Global warming thus has the effect of depleting atmospheric oxygen, that goes far beyond the exhaust gases released in the atmosphere, causing the greenhouse effect, and particle pollution affecting the air quality in our cities. This would result in a worldwide mass mortality of living beings, including humans. The models indicate the possibility of a scenario where, after a certain period of increase, the temperature is set at higher but apparently safe values. In this case the system dynamics may exhibit a long-term quasi-sustainable dynamics. But this can however still result in an ecological disaster, namely the oxygen depletion and mass extinctions.

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Cryptic matters: The relevance of hidden biodiversity

We are losing biodiversity at an alarming pace. Scientists are widely accepting that we are heading into a sixth mass extinction event. Therefore, we need to understand and manage biological systems at a broad scale, in order to pinpoint threatened units - communities, species, or populations, and to apply not only more efficient conservation strategies, but also planning for species that have economic value. We are currently experiencing a new 'golden era' in biological sciences. The increased availability of molecular, occurrence and trait data for various organisms allows researchers to work at an unprecedented resolution and thus greatly facilitates conservation efforts. However, there still are tremendous gaps in knowledge, notably in invertebrates, by far the most speciose group of animals on the planet.

Our research group has addressed this shortcoming by assembling an unprecedented molecular, occurrence, and traits dataset, in terms of both taxon and geographic coverage, for arguably the most popular group of insects – the butterflies. The data

accumulated are aiding the 'transition' from studies restricted taxonomically and geographically towards comprehensive macroecological approaches and analyses of large datasets in this field of research. I will exemplify how the preview of genetic diversity helps to revise the taxonomy of butterflies, as well as the discovery of cryptic species and their properties. Although European butterflies are probably the best-studied invertebrates in the world, we are still discovering new taxa, many of which are so-called cryptic species (i.e. two or more morphologically similar species that were treated as conspecific). Moreover, we found that, in the western Mediterranean, cryptic species tend not to co-occur and display chequered distribution patterns. These findings represent a change of paradigm in showing that cryptic diversity comprises idiosyncratic qualitative aspects in addition to merely quantitative ones and highlight the importance of differentiating cryptic species for various research fields. We demonstrated that these patterns of distribution are a general phenomenon for cryptic butterfly taxa in the western Mediterranean as could also be the case for other organisms. But which are the mechanisms that generate and maintain them? We addressed this question and investigated potential causes producing such chequered distribution patterns by using a multidisciplinary approach on two pairs of cryptic species. We showed that the strongest genetic contrasts between both cryptic pairs occurred over short distances, and always over sea straits. This is a multifaceted phenomenon that cannot be explained by simple hypotheses and we pinpoint some of the key players, including species interactions, which are usually forgotten in ecology given the difficulty to assess their importance. Unveiling cryptic species is a challenging endeavor but of primary importance for a comprehensive description of biodiversity. The finding that cryptic groups of species present characteristic geographical distributions highlights the need to further study potential particularities they may display, as well as to assess their implications in multiple research fields that investigate not only butterflies, but other organisms as well.