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UNESCO Bangkok
Regional Unit for Social and Human Science
in Asia and the Pacific

Asia Pacific Perspectives on Environmental Ethics

CONTENTS

ACRONYMS

CBD: Convention on Biological Diversity
CHRB: Convention on Human Rights and Biomedicine
CIOMS: Council for International Organizations of Medical Sciences
COMEST: World Commission on the Ethics of Science and Technology
CSR: Corporate Social Responsibility
GM: Genetically Modified
GRP: Gross Regional Production
ELQ: Environmental life-quality
ELSI: Ethical, Legal and Social Impact
GMOs: Genetically Modified Organisms
IBC: UNESCO International Bioethics Committee
I-O: Input - Output
LMOs: Living Modified Organisms
NGOs: Non-Governmental Organizations
OECD: Organization for Economic Cooperation and Development
RUSHSAP: Regional Unit for Social and Human Sciences in Asia and the Pacific
TS: Transcendental (panspecific) subject
UNESCO : United Nations Educational, Scientific and Cultural Organization

PREFACE

Human beings are one of millions of species alive on the planet Earth, and in our interactions with living organisms and our natural environment we have developed environmental ethics. Article 17 of the Universal Declaration of Bioethics declared by the UNESCO General Conference in 2005 recognised this in the statement:

> "Due regard is to be given to the interconnection between human beings and other forms of life, to the importance of appropriate access and utilization of biological and genetic resouces, to respect for traditional knowledge and to the role of human beings in the protection of the environment, the biosphere and biodiversity."

Without sustaining the environment human beings will not survive. Reflecting this concern, UNESCO has made ethics of science and technology one of its five priority areas. This volume offers perspectives from persons in a range of countries across Asia and the Pacific on environmental ethics, capturing some of the diversity of views and challenges that UNESCO needs to address as it turns increased attention to environmental ethics.

UNESCO's programme in this area aims to strengthen the ethical link between scientific advancement and the cultural, legal, philosophical and religious context in which it occurs. UNESCO's strategy in bioethics has been to act as a standard-setter on emerging ethical issues, to disseminate information and knowledge and to help Member States build their human and institutional capacities. The standards include the Universal Declaration on the Human Genome and Human Rights, adopted by UNESCO's General Conference in 1997 and the Universal Declaration on Bioethics and Human Rights, adopted by UNESCO's 33rd General Conference, in 2005.

This collection of papers is the fourth in a series of books from RUSHSAP[1], UNESCO Bangkok offering Asia-Pacific Perspectives on Ethics, each focusing on specific themes. The contents come from submitted papers to UNESCO Bangkok Bioethics conferences held since 2005, assembled thematically. They also include the discourse from the 2005 conference, as intercultural communication is part of the essence of deliberation on bioethics.

The First UNESCO Bangkok Bioethics Roundtable was held 11-15 September, 2005, as the first event in Bangkok of the 60th anniversary of UNESCO. The UNESCO Bangkok office is the largest UNESCO branch office in the Asia-Pacific Region, which for UNESCO includes 46 member countries from Turkey in the West, to Japan in the East, and New Zealand and 17 Pacific Island nations to the South. It is designated as the regional office for coordinating implementation of UNESCO programmes on ethics of science in Asia and the Pacific with the Division of Ethics of Science and Technology.

In light of the recommendations issued by the World Commission on the Ethics of Science and Technology (COMEST) in December 2006, which noted both the existence of a background consensus on many issues related to environmental ethics and the absence of any commonly accepted or comprehensive framework, future activity in ethics of science and technology will seek to take forward the work of conceptual elaboration, consensus development and capacity building with a strong connection to the relevant intersectoral platforms in reflection on environmental ethics. This volume contributes to the reflection on the issue, and working groups on particular topics have been established in 2007 at the launch conference of the project on Ethics of Energy technologies. Work from that project will be published in a future volume in this series.

In the preparation of this book I wish to thank the active discussion and participation of all the persons

1 www.unescobkk.org/rushsap

who attended the UNESCO Bangkok meetings. A special thank you is due to Silvie Poeth and Daniel Calderbank for help in editing the papers, and to Frankie Keller for transcribing the discussion from the 2005 meeting. The cover design is thanks to Alessandro Blasi and the book text layout was prepared by Celia Thorheim. We look forward to increased discourse on these papers not to be seen as the final word on these topics, but rather as ways to catalyze a greater regional discussion of bioethics and governance of science as applied to the environment according to accepted ethical, legal and social practices.

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Semantics and agro-environmental bioethics: epitomizing conceptual and perceptual domain of human realisation*

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Introduction

The area between sensation and conceptualization is a fuzzy contour of human understanding. Despite abundant philosophical and empirical research, results about how to understand this area that command widespread assent are very scarce. One contributory source to this impasse is the fact that, for mature and intact humans, the sensory, the perceptual, and the conceptual seem merged in consciousness. Perception is phenomenally so "cognitively penetrable" - so infused for humans by discursive understanding - that experimental and theoretical efforts to distinguish between it and conceptualisation, and consequently between it and sensation, often seem constrained only by whatever favoured theory drives the effort. In what follows, we may consider reasons for distinguishing perceptual from conceptual categories and suggest a way of making the distinction between different thoughts and actions.

For example, environmental law is the resultant products of the conditions that arise from the technology humans have developed to satisfy their biological and social needs. Law itself is a social technology. It is a means modern societies use to deal with the challenges generated by the competitive and cooperative activities by which humans make use of the mundane resources. As humans secure their survival by their use of technology, they alter the conditions of their lives. Societies legislate in order to maintain the stability of the social order. Law is the way societies manage technology in ways that keep them from destroying themselves and their environment.

Interestingly the life of any organism depends on the death and life of other organisms. Nature is competitive in two respects: individual creatures' survival depends upon the death of individual members of other species, and the survival of some species depends on the failure of others. Nature is also cooperative. Biologists who follow Darwin in interpreting evolution as a struggle for survival also recognise evidence of what Kropotkin called mutual aid, a natural propensity to cooperate which always emulates the conceptual and perceptual domain of human cogitation and can be defined as biolegacy. Many organisms are social, and the survival of entire species depends on symbiotic relations between members of different species.

As ambiguous as the biological legacy is for animals, the situation is even more conflicted with respect to the biology of human nature. Spencer and the social Darwinists saw human society as a struggle in which only the fittest and most competitive survive. Huxley agreed but drew different conclusions. Like Hobbes, he believed the natural state of human existence to be "the war of each against all". Life among primitive peoples for him is "a continuous free fight", which the social order was established to prevent.

Rousseau, the young Marx, and Freud, on the other hand, regarded destructive competition as a departure from the natural state of humankind, which is cooperation. They saw human behaviour as unnaturally deformed by the conditions of modern society. Human beings are manipulated, tricked, or controlled by those who oppress them, resulting in alienation or repression. Other theorists, behaviourist psychologists and some Marxists and sociologists, regard human behaviour as initially unstructured and plastic, and view human nature as entirely a social product. As the sociobiology debates illustrate,

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the question to how much of human behaviour is attributable to biological structures and how much to historical and environmental influence is one that refuses to go away.

Concept-percept: A virtual bioethical language

Rather than pursue the debate over human nature at first, we would like to discuss about the details of conceptual and perceptual domain of human realisation being the crux of human sociobiology. An approach to the problem of our concern can be made through the Wittgensteinian problematic: Is all seeing, seeing as; and, more generally, does all perceiving require interpretation? On the account suggested by the considerations we shall make, both questions are obscure; the notions of seeing as and interpretation that are engaged by them fail to distinguish between non-conceptual categorisation and conceptualisation. It may be that all visual perception requires categorisation, even though not all categorisation is conceptual. This failure is symptomatic of widespread unclarity about how to understand the differences among sensation, perception, and conceptualisation.

Sometimes the Wittgensteinian problematic is taken as inviting an account of "seeing an aspect", where this is understood as equivalent to an account of seeing something "under an aspect". Recent discussions of "perceptual content", for example, of the perceptual content motivating frogs's leaps at flies, suggest this interpretation. Talk about perceptual content, as of mental content in general, invokes the metaphor of mind as container, standardly, as container of information, and directs one to provide a discursive account of the purported content. To give such an account, however, of what is presumed to be phenomenal "content" how it seems to the frog for example is to engage in conceptualising that content, and from the frog's point of view as it were. But this is to suppose that it is the frog, and not we, who conceptualises this content, a suggestion that can hardly be supposed transparently true, however compatible with some favoured metatheory it may be.

Considerations like this one recommend that casting questions about differences between perception and conception in terms of mental content be avoided, whenever it is possible to do so. For it may be natural to suppose that the frog perceives, but not natural, absent more compelling evidence, to suppose that it conceptualises that which it perceives.

In general, whether or not it turns out that the ability to conceptualise is in fact dependent upon having a public language, one is on safer ground to limit clear examples of conceptualisation to creatures who manifest their conceptualisations in explicit judgments.

Several sets of circumstances conspire to obscure the differences between perceptual and conceptual categories. Here is one such set. Normally we distinguish between sensation and perception in complex and multifunctional organisms according as the response that is evidence for either is a local response by some part of the organism or a general response of the whole organism. Such reflex responses as withdrawing the hand from a hot object are clear examples of the former while fleeing from a predator is normally an example of the latter. A response that is a general response of a whole complex organism, and thus evidence of perception, requires for its explanation some reference to central processing by the organism because a complex organism is presumed to require some way of coordinating its various parts in order to make a whole-organism response.

Thus in humans, the best evidence for categorization is linguistic evidence, what category the subject says an object belongs to.

Perception and conception are conflated, in particular, whenever it is supposed that if there is a general, whole-organism response, then a generalisation that "sends" as it were, appropriate information to each part of the organism involved in the response constitutes a judgment about the character of the stimulus. For, in this way, judgment - construed as generalisation is projected onto pattern recognition and perception.

Categorisation is thus construed as conceptualisation and taken to be a single central function of an organism in which distinguishable stimuli are understood and responded to as if they were identical. In one example of this conflation, Miller and Johnson-Laird (1976) studied perception and language. They discounted any developmental distinction between a response and an assertion on grounds that there

is no evidence that such a development occurs. Consequently, they built judgment into perception itself, dispensing with any need to account for assertion as a distinct cognitive practice.

But what would count as evidence of such a developmental difference in the course of language acquisition? Certainly, anything that is a response, linguistic or non-linguistic, is categorical in as much as it is a whole-organism response to some generalised perception, one, that is, which involves pattern recognition by the organism as a whole, and, thus, also involves central processing. Nevertheless, there may be a difference between perceptual categorisation and conceptual categorisation that is discounted if all evidence of categorisation is taken as evidence of conceptualisation.

Another example of the tendency to conflate perceptual and conceptual categorisation is suggested by Medin and Barsalou's comparative study: "Categorization Processes and Categorical Perception" (1987). They begin this review of experimental data on categorisation presuming a distinction between "sensory perception" (SP) categories and "general knowledge" (GK) categories and identifying general knowledge categories with (linguistic) semantic categories; thus, they begin by assuming that perceptual and conceptual categorisation are different phenomena. They propose to compare the two types because most empirical research has been on one or the other, but not both. The conclusion of their comparison, however, seems to bring them close to conflating perceptual and conceptual categories. The conclusion of their comparison is that there are "deep similarities" between SP and GK categories, and they urge further study at this intersection which help us to analyse the idea synthesis being the basics of understanding the ethical evolution.

How might a distinction between perceptual and conceptual categories be drawn, supposing that the above considerations suggest that such a distinction should be made? How, that is, might we conceive of the difference between such types of categories so as to capture the chain of intuitions linking the considerations raised above? And, further, can we conceive of such a difference in a way that might provide some conceptual advance about the several issues currently we are facing with a moral dilemma?

We propose that the focus for such a distinction may be found in adopting a principle introduced by Evans, what he called the "Generality Constraint" as a characterisation of conceptual categorisation and as distinguishing it from perceptual categorisation. Although Evans introduced his principle in a context different from this one and with quite different theoretical goals from those that we are presently concerned with bioethics in relation to agro-environment based empirical analysis.

Evans was also keenly aware of the importance, and the difficulty, of distinguishing between perception and conception. Indeed, Gillett has argued (1987) for the stronger conclusion that there is a conceptual relation between Evans's constraint and the idea of a conscious thinking subject. The constraint is introduced in Evans's work during the course of discussing Russell's theory of singular terms and was intended to contribute to an account of what is required for a person to be able to make a predicative judgment about a particular individual and/or incident.

Hence, the sentence schemata used in its statement are schemata for particular statements, and, so, use individual constants (i.e., Δ). The present discussion is that the same constraint, with some minor changes that include changing its individual constants to variables (e.g., Δ to Δn) in the schemata, can be used also to characterise the ability conceptualizers have to make predicative judgments using general terms, concepts, or conceptual categories.

Human-environment: Interactive model for bioethics study

Now we will focus on the relation between humans and their environment as compared with that of other creatures. Like everything else in the biosphere, humans exist by effecting changes in their environment. Whatever any creature does to keep itself alive affects other flora and fauna. Human interaction with nature differs from that of other creatures by their use of tools and technology. Unlike other species, humans do not do very well without tools and technologies, either in exploiting their environment or in defending themselves against other species. They need technologies in order to survive.

Technological development is cumulative. History began when technological change so altered

the conditions of human life that the world to which each generation of humans had to adapt was significantly different from the one its ancestors inherited and different from the one it bequeathed to its successors.

Humans have histories because they have developing technologies. As change in the natural environment drives biological evolution, technological change drives cultural evolution. Since human-environmental interactions are mediated by technology, no environmentalist philosophy can be in total opposition to technology. Environmental policy questions are not about whether humans should intervene, but how. Humans have a dual relation to nature: they are part of nature and they stand outside of it.

To the extent that they are outside nature, everything they do is a form of intervention. Their capacity to disturb the rest of nature is linked to their propensity to be concerned about it and to intervene. Environmental protection advocates employ technology, not only in their everyday lives, but also by promoting species management, environmental conservation, biological research, and law enforcement. Environmentalism assumes both the possibility and the necessity of intervention.

Human activity is not the only source of massive species destruction, of course. At least five earlier mass global extinctions during the last half-billion years have been noted by paleobiologists, the most recent of these involving the extinction of the dinosaurs 65 million years ago. Humans are the perpetrators only of the last - or most recent - spasm of massive species destruction. Human concern about environmental threats derives not from the fact that humans can be blamed for rapid and extensive species destruction but from a recognition that humans are the only creatures that are able to do anything about it. Technological problems spawn technological solutions. Humans engage in productive and destructive acts and they also have the capacity to deliberate and conscientiously intervene in each others' lives and the lives of other creatures. Technology threatens nature and it manages that threat.

Human behaviour is governed by two kinds of laws. Biological laws provide the basis for explanations of what happens in the lives of natural creatures. Environmental laws are prescriptive legal rules that human beings enact to direct and restrain what their conspecifics do in and to nature. Laws of the second kind, which apply only to humans, protect the parts of the world that are governed only by laws of the first kind, by limiting what happens as a result of human use of tools and technology.

Positive law - the rules human societies adopt to direct voluntary action-can be conceptualized in two ways, corresponding to two ways of viewing the management of human behaviour. Rules are outcome-directed, or they are process-oriented. Laws are designed either to achieve or prevent certain types of outcomes or to promote and maintain social practices. Rules can serve to advance independently specifiable goals, and they can secure the continued operation of a system of activities.

Law that fits the outcome-directed model is exemplified by substantive criminal law. Its prohibitions presuppose the existence of independently identifiable wrongs - conduct that is bad in itself or bad because of its foreseeable consequences. Whether grounded in natural law or based on a social value such as utility, criminal law is directed toward acts whose rightness or wrongness does not depend on the laws that prohibit them.

Arguably, much of the law that limits the use of technology is outcome-directed well. Technology regulation concerns the way people do things, but its focus is often on resulting states of affairs. Legislation is supposed to prevent people from pursuing goals using methods and materials in ways that produce unacceptable outcomes. Rules governing the use of hazardous commodities are defended as needed to protect the innocent from the intended and unintended consequences of their use. Technology law addresses the negative externalities of productive activity.

Process rules have a different thrust from outcome-directed rules. Their purpose is to maintain procedures and processes whose continuance is important to the functioning of a collective. Laws of this kind regulate human activity not for sake of achieving or preventing specific outcomes but to allow activities to continue without breakdown. Their job is to moderate, not to prohibit. Process laws balance opposing interests. Their efficacy depends on the extent to which they prevent the destruction of practices that can yield any of a number of possible outcomes, or no outcome at all.

The process model finds its clearest application in politics and in the legal process itself. Election laws set the rules of political succession by specifying how a political system can continue without serious disruption. Rules of criminal procedure and civil procedure detail the ways disputes are to be resolved while maintaining peace and stability. The function of these rules is not to prevent harm or achieve any specific result but to keep the activity going.

Commercial transactions are also governed by process laws. Contracts facilitate human interaction by setting boundaries around certain classes of activities. Rules of contract encourage productive exchange by reducing risks. By increasing the likelihood that transactions will be mutually beneficial, these rules help to keep the economic system running smoothly. Anti-trust laws maintain competition by regulating aspects of commercial activity that are destructive of competition. They protect human agents by restraining acts that would lead to the cessation of their productive activity. The benefit to outsiders of anti-trust law, thus conceived, is secondary to the preservation of process.

The quintessential practice whose rules are process laws is a game. Games are self-contained activities with no external payoff and no predestined winners or losers. Rules limit what participants can do to each other, but only so far as they are all players in the game. The importance of what happens in a game depends entirely on its role with respect to other occurrences within the game. Nothing outside the game is supposed to affect the outcome.

Besides constituting a set of activities as a game, rules ensure that the game continues to run its course. The rules are not designed to prevent anyone from suffering the harm of losing. Enforcement is important, not to ensure or prevent any particular outcome, but to allow the activities of game-players to continue without disturbance. Cheating renders a game unstable. Participants are compelled to follow the rules in order that the game go on. Games are governed by a number of different types of rules. Rules of play and the rules of scoring define the course of the game and indicate how the outcome is determined. Rules specify the actions participants must perform, and in some instances disallow certain actions and bodily movements. Rules of participation determine who shall be allowed to play. Rules also specify the arena. Other rules set the conditions under which the game is to be played. Still others work to neutralize certain natural and unnatural advantages.

The most important kind of rules, for the purposes of this essay, are technology rules. These are rules that are intended to eliminate or prevent the creation of advantages resulting from superior tools and technologies. In a game, this is done by specifying what equipment is and is not permissible. Balls and sticks have to be of regulation size. A baseball pitcher is prohibited from moistening the ball. Track and field competitors are not allowed to inject themselves with performance-enhancing chemicals. Boxers can use only gloves of a certain size and weight. By specifying and limiting technology, rules limit the extent to which any class of participants can dominate the game. They help to ensure that participation in this cooperative and competitive activity will not cease altogether.

The thesis being advanced here is that the most effective way to conceptualize rules that limit technology in nature is to view them as process rules whose function is to protect the environment in the ways that technology rules of games limit action in games. Environmental law is a form of technology regulation whose task it is to maintain the conditions that keep technological societies going.

Nature itself can be seen as analogous to a game. Like a game, nature is self-contained. Its effects are found only within nature, and need not be assessed in terms of any outside standard. Nature's continued survival, from a naturalist perspective, is all there is. There are no privileged players, no preordained winners or losers, no one who deserves to win or lose. It is the system that must survive, not any particular components. As nature is both competitive and cooperative, so are games. A game is a cooperative enterprise wherein participants compete against one another according to the rules.

Conceiving nature according to a game model allows us to view technology's threat to nature as comparable to the potentially disruptive effects of technological innovation on competition within a game. Collective acceptance of constraints makes the game possible. Use of extraordinary means for pursuing individual ends can lead to its destruction of the entire enterprise. When a player or team introduces a device that enables it to vanquish all opponents and makes them unable or unwilling to continue to participate, the game is ruined.

The idea that rules function to keep the game going explains why there are rules of ritualized conduct, and even rules of war. Traditionally, war has been waged according to rules. To the extent that both sides adhere to rules of military engagement, war is a cooperative venture. A state of war requires mutual recognition that both sides are engaged in armed conflict. Rules keep the brutality from escalating to the point where all participants are in danger of being wiped out.

Rules of war include technology rules. Such rules limit the kinds of destruction that one side may inflict on the other. The adoption of a rule by the Geneva Convention after the First World War not to use poison gas represented a collective decision of nations not to allow such injuries to continue as part of the costs of war. The kind of war everyone wants to avoid is the war that will end all wars, because there will be nobody left to fight on either side. War technology rules preserve the World for more wars.

Games are a paradigm of what Rawls calls pure procedural justice. In a game there is no independent criterion for the rightness of the result. It is not merely that the rules must be followed for the game to be fair: the rules are all there is. Pure procedural justice means that the outcome is fair whatever it is, as long as the activity is carried out according to mutually agreed-upon rules. That situation contrasts with the imperfect procedural justice of a criminal trial, wherein a person is supposed to be convicted if and only if he has committed the offence with which he is charged.

There procedural fairness makes a correct result likely, but it does not guarantee it. Activities such as games, wherein competition occurs against a background of cooperation, depend on notions of fairness. Fairness is a matter of procedure, not outcome. In nature, love, and war, as in games, all is not fair. When the rules of a game dictate that the contest shall be won by skill, strength, or fortune, succeeding by other means is unfair. An unfair procedure is one in which a participant has an unfair disadvantage. An unfair practice gives its user an advantage that is deemed unfair because it falls outside recognised rules of competition.

Fairness does not require that everyone have an equal chance of winning or achieving dominance, however. Fairness implies a kind of equality whereby everyone is bound by the same rules, but it does not require the sides to be evenly matched, or that the outcome was ever in doubt. A lop-sided contest can still be judged fair as long as none of the differences between contestants is seen as arbitrary.

Not all games are fair, furthermore. A game can be unfair even when nobody cheats, if the rules favour one side or the other. A game is fair only when the rules minimise the effects of arbitrary conditions. A gambling game is unfair if the bets are unfair. (A fair bet is one in which no participant has a rational expectation of gain.) When the rules of a gambling casino give an enormous advantage to the house, fairness is violated. The same would be true of an insurance plan in which one's chances of "winning" depend significantly on whether one is the seller or the purchaser of the insurance. The rules of that kind of game would ensure unfairness.

One way that a contest can be unfair is for the outcome to be determined by one side's having access to technology not available to the other. Among the rules that maintain competition in sports, we have noted, are technology rules. Disparate technologies upset equality of chances of winning in ways that may be considered arbitrary. Technological advantage can turn a fair contest into an unfair one - or at least provoke complaints to that effect - by shifting the balance between competitors.

In a race of gravity-powered go-carts known as the Soapbox Derby, for example, fairness was violated when one competitor surreptitiously installed an electric motor into his cart. If the rules are designed to maintain lively competition, that purpose is frustrated when devices are employed that allow one competitor to dominate the outcome. Technology regulation serves to maintain an appropriate degree of fairness.

Sports rules regulate technology by placing limits on the equipment participants may use. When a pole vaulter first introduced a fiberglass pole or the America's Cup was won by a multi-hulled boat, or when a weightlifter or shot putter takes steroids and runners engage in "blood-doping" (where a contestant receives a transfusion of artificially oxygenated blood), rule-makers have reason to be concerned. Rules specify types of sticks and poles, types of shoes, and types of substances competitors may inject or ingest. Unless the contest is itself a competition between technologies - automobile racing is an

example -technology upsets the balance that fairness requires because it renders the existing rules inadequate to preserve fair competition.

There are no principles behind these technology rules, other than they should contribute to what will be acknowledged as a proper balance. Rule-makers' concern is not to eliminate all differences, but only those that allow some participants to dominate. The criteria are pragmatic: whatever is in the interest of the game. What matters is that the game be fair and to be seen as fair. Technology rules are adopted in order to sustain that end. If participation is voluntary and motivated by a desire to win, rational players will demand that the game be fair as a condition for entering.

Among the kinds of activities wherein fairness is determined by technology rules are those human interactions with nature that comprise the predatory sports. Hunting and fishing - at least to the extent that they are governed by rules concerning what is and is not permissible - have the express logic of games. Hunting laws limit the season, the quarry and the weapons. So far as they are conceived as sport and not (merely) as productive activity, they are expected to reflect standards of fairness. Environmentalists typically recognise at least minimal technology as fair.

Few environmentalists are upset by fly-fishing. Sport fishing by machine gun, on the other hand, would probably be universally condemned. Tracking deer with electronic motion-detectors, using headphones that amplify low-decibel sounds and deaden loud noises and using a rifle equipped with a high-powered telescopic sight, all contribute to making hunting a very different activity from hunting by longbow. The use of maximal technology strikes most sports enthusiasts as unfair. They say that it takes all the fun out of it.

Given that humans make the rules, it should not be surprising that they favour the human contestant. Rules tend to focus on fairness between human competitors rather than between humans and other creatures. The rules are designed to give the quarry a chance, but not an even chance. Biased standards are standards nonetheless. In bullfighting - one of the most ritualised of predatory sports - the rules are set to ensure that the bull loses most of the time, but not all of the time. The derision that greets the bullfighter who violates standards of fairness reflects the demand for fairness that sportsmen and women insist on, even in the most brutal sports. Sportsmanship is expected to prevail.

As technology undermines fairness in the predatory sports, so it does with respect to environmental interaction in general. Environmental regulations set limits as to how much and what kinds of assault on other organisms shall be permitted, given humans' need to consume other organisms in order to survive.

Human values, not biological necessity, are what make it acceptable to satisfy human desires by sacrificing some flora and fauna and not others, and unacceptable to destroy as many as the most aggressive may choose. In the absence of an independent outside standard that determines what kinds of plunder shall be allowed, human agents' concern must be limited to choosing rules that the human community believes achieves fairness, all things considered. The analogy with hunting and fishing reminds us that political battles over environmental issues are debates concerning what is fair - not only with respect to contending human parties, but to other creatures as well.

Fairness being a human value, it has no place in nature except as humans are themselves intervening participants. As far as interactions involving only nonhuman creatures are concerned, nothing in nature is either fair or unfair. That some animals prey on others by taking advantage of their weakness does not raise the question of fairness. Humans, as voluntary and responsible agents, regulate their interactions with nature because they value the continued existence of the natural world and the species it contains. They make legislative decisions requiring substantive determinations reflecting human values, and they are accountable for following or flouting environmental rules.

Fairness in interaction with other organisms is in some respects like fairness in a political order, but it reaches beyond. Like fairness in politics, environmental fairness requires procedures for determining whose values will be decisive. Unlike political fairness, it requires being fair to creatures that are neither members of the electorate, nor represented by members. Regulation by humans need not be construed as only for humans.

Some people may resist the game analogy for environmental regulation, stressing that much of environmental law is specifically designed to prevent specific kinds of harm. The process model is, after all, not the only way that environmental protection can be conceived. Critics of the game analogy may point to environmental protection laws that are designed to prevent certain kinds of harm such as pollution and the destruction of species. Laws regulating automobile engines and fuel, like laws regulating ownership of weapons, are surely intended to prevent harm to those who breathe the air. Conservation laws prevent the destruction of (some) items of natural beauty. Endangered species laws are supposed to preserve the present configuration of natural kinds of creatures on earth. Pesticides are prohibited because of their harmful effects on creatures other than the ones they have been devised to control. Recycling laws retard the exhaustion of natural resources and reduce the quantity of solid waste.

Acknowledging that many environmental laws target specific ends does not render the game analogy inappropriate for nature, however. The rules of games include not only internal, formal rules but also rules that limit the time, place and manner in which an activity can be pursued. There are restrictions as to where and when a game can be played, and there are rules that determine who is an eligible participant. Like the predatory sports, games are confined within socially recognised limits. Bald eagles and Bengal tigers are ineligible players.

Regulations entail restrictions, but that does not make them prohibitions. There are indeed conditions under which playing a game has independently identifiable bad effects. Sports activities are often limited for that reason. Duelling is illegal and boxing is regulated because of these sports' adverse consequences. Bad consequences are also the reason why the trade in rhinoceros horns and elephant tusks and alligator hides is prohibited. Societies have rules that restrict human economic activities in order to keep them from depleting certain of the earth's resources. The rationale is not that extracting wealth from nature is bad, but that it can have harmful consequences when pursued in certain ways. Like the rules of games, rules that direct human productive activity enable as well as restrict.

Regulations in general are not prohibitions, except in a derivative sense. By requiring that activities be done safely and in moderation, regulatory rules allow cooperative and competitive enterprises to flourish. Laws that specify limits concerning wages, hours, and the work environment should be considered not as prohibitory legislation but as rules that set conditions conducive to the safe conduct of these activities. By the same token, rules that limit human productive and non-productive activity for the sake of environmental conservation, like laws of business practice, are laws that can be thought of not as preventing evils but as contributing to the preservation and continuation of practice.

Conceiving environmental laws as process rules does not imply that laws governing human conduct with respect to other creatures must be seen in all cases as regulation of legitimate activities. Laws regarding the treatment of dogs and cats are clearly designed to prevent abuses and are better seen as proscriptions of plain wrongdoing. Such measures are more like criminal law than they are like rules of a game. Animal protection laws that presuppose independent notions of right and wrong are not environmental laws at all, because they are directed at individuals rather than species. Laws that protect individual creatures are aimed not at regulating technology but at achieving certain specific results.

Environmentalists' efforts to save tropical rain forests and endangered species lead them to seek laws they believe will to achieve those ends. The burden of this essay has been to suggest that the ultimate concern of preservationists, like that of sports promoters, is to maintain a lively competition. Technology skews the ecological balance in the same way that it upsets fairness in sport. Applications of technology to improve performance beyond what competitors lacking that technology can achieve not only reduces competition but can ultimately destroy the activity altogether. Wiping out species through the use of powerful technologies ends the game for present and future participants.

Disputes between those who view certain kinds of individual life as inviolable and those who view species as sacred objects whose extinction is tragedy, are irresolvable as long as they are conceived as struggles over what evils law should prevent. Political debates over the value of biodiversity and the rights of humans and other animals are less intractable when interpreted as disputes over how to keep the game of life going and what kind of game we want to play. The argument is not over ultimate values, but over competing forms of life.

Technology is where games and environmental concerns come together. Environmental regulations set forth what may and not be done with technology. By limiting the technological advantages humans enjoy over other creatures, environmental rules, like the technology rules of sport, serve to maintain a balance by ensuring that competition occurs at a certain level. Regulations are necessary to prevent some people from spoiling the game for others. That is all that can be expected of them.

Environmental and ecological studies often reflect a desire to help people disabuse themselves of the idea that humans are not part of nature. As coinhabitants of the natural world, humans need not and cannot accept the idea that nature is only a set of resources to be managed and exploited. Yet humans are outside of nature in that they are the only interveners. Recognition of the idea that humans do unnatural things is necessary for an environmental policy to be possible at all. The game analogy points us in the direction of remembering that humans are part of nature, that they belong to nature. It should also remind us that ultimately there is no difference between humans managing nature and humans managing their own affairs.

Philosophers have long been interested in meaning, but we believe they have often been hampered by the limits of their investigatory techniques. We think that modelling work on language and communication across a range of other disciplines, on the other hand, has sometimes been hampered by limited conceptual models for meaning.

Philosophers have typically relied on armchair reflection and linguistic intuition alone in developing theories of meaning, a source amplified only recently to include wider data from linguistics (Larson and Segal, 1995). One of our aims here is to offer computational modelling as an important addition to the toolkit for serious philosophy of language.

The limitations of modelling work across various disciplines due to limited conceptual models for meaning are somewhat more complicated. We offer a very rough sketch of alternative philosophical positions regarding meaning, both as a way of characterising trends in contemporary research and in order to make clear the approach that motivates our work here.

What is it for a sound or a gesture to have a meaning?

Idea synthesis: model approaches

The classical approach has been to take meaning to be a relation. A sound or gesture is meaningful because it stands in a particular relation to something, and the thing to which it stands in the proper relation is taken to be its meaning. The question for any relational theory of meaning, then, is precisely what the crucial relation is and what it is a relation to.

One time-worn philosophical response is in terms of "reference", taken as a relation to things in the world. Words have meanings because they have referents, and the meaning of a word is the thing to which it refers. In various forms such a theory of meaning can be found in Augustine (c. 400 AD), in Mill (1884), and in Russell (1921, 1940).

A second philosophical response is to consider meaning as a relation between a sound or gesture and the images, ideas, or internal representations it is used to express. On such a view the meaning of the word is that thing in the head it is used to convey. Communication becomes an attempt to transfer the contents of my head into yours, or to make the contents of your head match mine. An ideational theory of this sort can be found in Aristotle (c. 330 BC), Hobbes (1651), and Locke (1689), with a more sophisticated contemporary echo in Fodor (1975).

A third approach is to consider meaning as a relation neither to things in the world nor to the contents of heads but to some third form of object, removed from the world and yet non- psychological. Here a primary representative is Frege (1879).

It is our impression that relational theories of meaning are alive and well across the various disciplines involved in contemporary modelling regarding communication and language. The relational theory relied on is generally either referential or ideational; we take it as a sure sign that the theory in play is

ideational when the measure of "identity of meaning" or "successful communication" is correspondence between individuals' representation maps or signal matrices.

A referential theory, in which the meaning of a term is taken to be the object or situation it applies to, is more or less explicit in Batali (1995), Oliphant and Batali (1997), and MacLennan and Burghardt (1994). An ideational theory, in which communication involves a match of internal representations, is a clear theme in Levin (1995) and Parisi (1997); if activation levels of hidden nodes are taken as internal representations, Hutchins and Hazlehurst (1995) belong here as well. In modelling studies for language outside the immediate range of this paper we also find an ideational theory explicit in Livingstone and Fyfe (1999), Nowak, Krakauer and Dress (1999), Nowak, Plotkin, and Krakauer (1999), Nowak and Krakauer (1999), Livingstone (2000), and Nowak, Plotkin, and Jansen (2000).

Relational theories are not the only games in town, however. Much current philosophical work follows the intuition that variations on a Tarskian theory of truth can do much of the work traditionally expected of a theory of meaning (Quine, 1960; Davidson, 1967; Larson and Segal, 1995). Of prime importance since the later Wittgenstein (1953) are also a class of theories which emphasize not meaning as something a word somehow has but communication as something that members of a community do. Wittgenstein is a notoriously hard man to interpret, but one clear theme is an insistence that meaning is to be understood not by looking for "meanings" either in the world or in the head but by understanding the role of words and gestures in the action of agents within a community.

The emphasis on language as something used, and on significance as a property of use, continues in Austin (1962), Searle (1969), and Grice (1957, 1989). In Austin and Searle performative utterances such as "I promise" take centre stage, with the view that at least large aspects of meaning are to be understood by understanding an agent's actions with words. In Grice the key to meaning is the complicated pattern of intent and perceived intent on the part of speaker and listener.

We share with this last philosophical approach the conviction that a grasp of meaning will come not by looking for the right relation to the right kind of object but by attention to the coordinated interaction of agents in a community. In practical terms, the measure of communication will be functional coordination alone, rather than an attempt to find matches between internal representations or referential matrices.

The understanding of meaning that we seek may thus come with an understanding of the development of patterns of functional communication within a community, but without our ever being able to identify a particular relation as the "meaning" relation or a particular object concrete, ideational, or abstract as the "meaning" of a particular term. In applying tools of formal modelling within such an approach to meaning our most immediate philosophical precursors are Lewis (1969) and Skyrms (1996).

Although the modelling literature may be dominated by relational views of meaning, this more dynamical approach also has its representatives: we note with satisfaction some comments in that direction in Hutchins and Hazelhurst (1995) and fairly explicit statements in Steels (1996, 1998).

Here an analogy may be helpful. We think that current misconceptions regarding meaning and the road to a more adequate understanding may parallel earlier misconceptions regarding another topic, biological life, and the road to a more adequate understanding there.

There was a time when life was thought of as some kind of component, quality, or even fluid that live bodies had and that dead bodies lacked. This is the picture that appears in the Biblical tradition of a "breath of life", for example. As recently as Mary Shelley's Frankenstein (1831), life is portrayed as something that a live individual has and a dead individual lacks; in order to build a living being from dead parts one must somehow add the missing spark of life.

Conclusion: How far true?

We now have a wonderful biological grasp of the phenomena of life, elegantly summarised for example in Dawkins'"replicators" (Dawkins, 1976). But in our contemporary understanding life is not at all the kind of thing that Mary Shelley would have looked for. We understand life not as a magic component within individuals at a particular time but as a functional feature that characterises a historical community of

organisms evolving over time. Our understanding of life is also an understanding of something that may be continuous and a matter of degree: the question of precisely when in a history of evolving replicators the first creature counts as "alive" is quite likely the wrong question.

Our conviction here, and the underlying philosophical motivation for the model we would like to have at our disposal through the global bahaviourome programme, is that the same may be true of meaning. What we seek is a better understanding of the phenomena of meaning, which may come without any particular relation definable as the "meaning relation" and even without identifiable "meanings". The proper way to understand meaning may be on the analogy of our current understanding of life; not as an all-or-nothing relation tying word to thing or idea, but as a complex continuum of properties characteristic of coordinated behaviour within a community - a community of communicators - with respect to their environment and agriculture developing over time.

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4

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