European Journal of Science and Theology, February 2013, Vol.9, No.1, 17-31

FORESHADOWING ETHICAL AND SPIRITUAL CHANCES
THE ROLE OF MORAL MEDIATORS

Lorenzo Magnani*

University of Pavia, Department of Arts and Humanities, Philosophy Section, Pavia, Italy

(Received 19 August 2012)

Abstract

The recent epistemological and cognitive studies concentrate on the concept of *abduction*, as a means to originate and refine new concepts and hypotheses. Traditional Cognitive science and computational accounts concerning abduction aim to illustrate discovery and creativity processes in terms of *theoretical* and 'internal' aspects, by means of computational simulations and/or abstract cognitive models. Nevertheless, especially concrete manipulations of the external world constitute a fundamental passage in chance discovery: by a process of *manipulative abduction* it is possible to build prostheses (*epistemic mediators*) for human minds, by interacting with external objects and representations in a constructive way. In this manner, it is possible to create implicit knowledge through doing and to produce various opportunities to find, for example, anomalies and fruitful new risky perspectives. This kind of embodied and unexpressed knowledge holds a key role in the subsequent processes of scientific comprehension and discovery but also in ethical/spiritual thinking and in moral deliberation. Moral reasoning could be viewed as a form of 'possible worlds' anticipation, a way of getting chances to shape the human world and act in it. It could be of help to prefigure risks, possibilities, and effects of human acting, and to promote or prevent a broad variety of guidelines. Creating ethics means creating the cultural/spiritual world and its directions, in front of different (real or abstract) situations and problems. In this way, events and situations can be reinvented either as an opportunity or as a risk for new moral directions. The second part of the paper describes some of the 'templates' of manipulative behaviour which account for the most common cognitive and moral acting related to chance discovery and chance production.

Keywords: ethics, moral mediators, epistemic mediator, manipulative abduction

1. Moral acting in an undetermined world

Morality could be defined, at the very last, as "the effort to guide one's conduct by reason – that is, to do what there are the best reasons for doing – while giving equal weight to the interests of each individual who will be affected by one's conduct: there are not privileged people" [1].

* E-mail: lmagnani@unipv.it

Moral reasoning could be viewed as a form of 'possible worlds' anticipation, a way of getting chances to shape the human world and act in it. It could be of help to prefigure risks, possibilities, and effects of human acting, and to promote or prevent a broad variety of guidelines. Hence, we need: 1) to possess good and sound principles applicable to the various problems, able to give rise to arguments that can be offered for moral views opposite, and 2) appropriate ways of reasoning which permits us to apply the available reasons in the best way. Creating ethics means creating the spiritual world and its directions, in front of different (real or abstract) situations and problems. This process requires the adoption of skilful and creative ideas, in order to react in response of new previously unknown cases or in cases of moral conflict. In this way, events and situations can be reinvented either as an opportunity or as a risk for new moral directions.

2. An eco-cognitive and epistemological framework

Living morally is the capacity to apply a kind of cognition able to provide valuable moral knowledge and skilful templates which can explain behaviours, duties, and options, and to provide suitable deliberations. Moral deliberations relate to a sort of *selection* or *creation* of principles and to their application to concrete cases. We can both just select (or create, if we do not have any) moral principles and apply them to concrete cases or looking for the best ones among them according to some ethical meta-criteria. When we create new ethics, we provide new knowledge and new rules about problems and situations not yet clearly covered from the moral point of view. In this last case we certainly are in front of a particular case, but the problem is not only the one of ethically solving the case at hand by applying already available ethical concerns – indeed we lack a satisfactory moral knowledge to handle the puzzling situation. Instead, we need to create something new, for example new good reasons first of all able to provide an acceptable intelligibility of the problem. In short, new chances have to be 'extracted' and/or 'produced' [2].

Sometimes, rather than the mere application of thinking, to reach a satisfactory moral deliberation it could be necessary to immediately *act and manipulate* objects and situations in the environment. This is also due to the fact that usually moral decisions are based on incomplete or inconsistent information. In logical terms we can say we are in front of *non-monotonic* inferences, which try to draw defeasible conclusions from incomplete information. The same situation occurs in the case of practical reasoning: ethical deliberations are always adopted on the basis of incomplete information. (A logical system is monotonic if the function *Theo* that relates every set of wffs to the set of their theorems holds the following property: for every set of premises S and for every set of premises S', $S \subseteq S'$ implies $Theo(S) \subseteq Theo(S')$. On moral arguments that have a deductively valid or fallacious form (in the sense of classical logic) [3]. Recent research in the area of the so-called 'practical reasoning', that relates to figuring out what to do, is illustrated in [4])

To clarify these problems it could be useful to consider an epistemological model already used to study the revolutionary transformations in science [5, 6].

2.1. Theoretical and manipulative cognition

Abduction is the process of *inferring* certain facts and/or laws and hypotheses that render some sentences plausible, that *explain* or *discover* some (eventually new) phenomenon or observation; it is the process of reasoning in which explanatory hypotheses are formed and evaluated. There are two main epistemological meanings of the word abduction [5, 6]: 1) abduction that only generates 'plausible' hypotheses ('selective' or 'creative') and 2) abduction considered as inference 'to the best explanation', which also evaluates hypotheses. To illustrate from the field of medical knowledge, the discovery of a new disease and the manifestations it causes can be considered as the result of a creative abductive inference. Therefore, 'creative'' abduction deals with the whole field of the growth of scientific knowledge. This is irrelevant in medical diagnosis where instead the task is to 'select' from an encyclopaedia of pre-stored diagnostic entities.

Theoretical abduction certainly illustrates much of what is important in creative abductive reasoning, in humans and in computational programs, but fails to account for many cases of explanations occurring in science when the exploitation of environment is crucial. (Magnani introduces the concept of theoretical abduction [5, 7]. He maintains that there are two kinds of theoretical abduction, 'sentential', related to logic and to verbal/symbolic inferences, and 'model-based', related to the exploitation of internalized models of diagrams, pictures, etc., cf. below in this paper.) It fails to account for those cases in which there is a kind of 'discovering through doing', cases in which new and still unexpressed information is codified by means of manipulations of some external objects (*epistemic mediators*). The concept of *manipulative abduction* [5] captures a large part of scientists thinking where the role of action is central, and where the features of this action are implicit and hard to be elicited: action can provide otherwise unavailable information that enables the agent to solve problems by starting and by performing a suitable abductive process of generation or selection of hypotheses.

Many attempts have been made to model abduction by developing some formal tools in order to illustrate its computational properties and the relationships with the different forms of deductive reasoning [8]. Some of the formal models of abductive reasoning are based on the theory of the *epistemic state* of an agent [9], where the epistemic state of an individual is modelled as a consistent set of beliefs that can change by expansion and contraction (*belief revision framework*). These kinds of logical models are called sentential [5, 6]. They mainly refers to the *selective* (diagnostic) and merely *explanatory* aspects of reasoning and to the idea that abduction is mainly an inference *to the best explanation*.

3. Generating ethical chances through manipulative abduction

3.1. Chance and implicit knowledge

As pointed out by Polanyi in his epistemological investigation, a large part of knowledge is not explicit, but tacit: we know more than we can tell and we can know nothing without relying upon those things which we may not be able to tell [10]. As Polanyi contends, human beings acquire and use knowledge by actively creating and organizing their own experience: tacit knowledge is the practical knowledge used to perform a task. As I already illustrated, the existence of this kind of not merely theoretical knowing behavior is also testified by the many everyday situations in which humans are perfectly able to perform very efficacious (and habitual) tasks without the immediate possibility of realizing their conceptual explanation: they are not 'theoretically' *aware* of their capabilities. In some cases the conceptual account for doing these things was at one point present in the memory, but now has deteriorated, and it is necessary to reproduce it, in other cases the account has to be constructed for the first time, like in creative experimental settings in Science.

Hutchins illustrates the case of a navigation instructor that for 3 years performed an automatized task involving a complicated set of plotting manipulations and procedures [11]. The insight concerning the conceptual relationships between relative and geographic motion came to him suddenly 'as lay in his bunk one night'. This example explains that many forms of learning can be represented as the result of the capability of giving conceptual and theoretical details to already automatized manipulative executions. The instructor does not discover anything new from the point of view of the objective knowledge about the involved skill, however, we can say that his conceptual awareness is new from the local perspective of his individuality. We can find a similar situation also in the process of scientific creativity. Too often, in the cognitive view of Science, it has been underlined that conceptual change just involves a *theoretical* and 'internal' replacement of the main concepts. But usually researchers forget that a large part of this processes are instead due to *practical* and 'external' *manipulations* of some kind, prerequisite to the subsequent work of theoretical arrangement and knowledge creation. When these processes are creative we can speak of manipulative abduction (cf. above). Scientists need a first "rough" and concrete experience of the world to develop their systems, as a 'cognitive-historical' analysis of scientific change [12, 13] has carefully shown.

The prevailing perspective among philosophers is that the processes of discovery and the consequent new incoming scientific representations are too mysterious to be understood. This view receives support from numerous stories of genius' discoveries, such as Archimedean eureka-experiences. Such accounts neglect periods of intense and often arduous thinking activity, often performed by means of experiments and *manipulative* activity on external objects; these are periods that prepare such 'instantaneous' discoveries. It is also important to

understand that the scientific process is *complex* and *dynamic*: new representations do not emerge completely codified from the heads of scientists, but are constructed in response to specific problems by systematic use of heuristic procedures (as pointed out by Herbert Simon's view on the "problem-solving process" [14]. Traditional examinations of how problem-solving heuristics create new representations in science have analyzed the frequent use of analogical reasoning, imagistic reasoning, and thought experiment from an internal point of view. (The empirical 'in vivo' recent research by Dunbar [15], in many Molecular biology and Immunology laboratory in US, Canada and Italy, has demonstrated the central role of the unexpected in creative abductive reasoning: "scientists expect the unexpected".) However attention has not been focalized on those particular kinds of heuristics, that resort to the existence of *extra-theoretical* ways of thinking (*thinking through doing*) [16]. Indeed many cognitive processes are centered on *external representations*, as a means to create communicable accounts of new experiences ready to be integrated into previously existing systems of experimental and linguistic (theoretical) practices.

For example, in the simple case of the construction and examination of diagrams in elementary geometrical reasoning, specific experiments serve as states and the implied operators are the manipulations and observations that transform one state into another. The geometrical outcome is dependent upon practices and specific sensory-motor activities performed on a non-symbolic object, which acts as a dedicated external representational medium supporting the various operators at work. There is a kind of an epistemic negotiation between the sensory framework of the problem solver and the external reality of the diagram [7]. It is well-known that in the history of Geometry many researchers used internal mental imagery and mental representations of diagrams, but also self-generated diagrams (external) to help their thinking.

This process involves an external representation consisting of written symbols and figures that for example are manipulated 'by hand'. The cognitive system is not merely the mind-brain of the person performing the geometrical task, but the system consisting of the whole body (cognition is *embodied*) of the person plus the external physical representation. In geometrical discovery the whole activity of cognition is located in the system consisting of a human together with diagrams. An external representation can modify the kind of computation that a human agent uses to reason about a problem: the Roman numeration system eliminates, by means of the external signs, some of the hardest parts of the addition, whereas the Arabic system does the same in the case of the difficult computations in multiplication. The capacity for inner reasoning and thought results from the internalization of the originally external forms of representation [17]. The external representations are not merely memory aids: they can give people access to knowledge and skills that are unavailable to internal representations, help researchers to easily identify aspects and to make further inferences, they constrain the range of possible cognitive outcomes in a way that some actions are allowed and other forbidden. They increase the chance discoverability.

3.2. The extra-theoretical aspects of ethical chance: templates of moral acting and moral mediators

We have introduced above the notion of *tacit knowledge*. Now we propose an extension of that concept. There is something more important beyond the tacit knowledge 'internal' to the subject - considered by Polanyi as personal, embodied and context specific. We can also speak of a sort of tacit information 'embodied' into the whole relationship between our mind-body system and suitable external representations. An information we can extract, explicitly develop, and transform in knowledge contents, to solve problems.

As we have already stressed, Peirce considers inferential any cognitive activity whatever, not only conscious abstract thought; he also includes perceptual knowledge and subconscious cognitive activity. For instance in subconscious mental activities visual representations play an immediate role. Peirce gives an interesting example of model-based abduction related to sense activity: "A man can distinguish different textures of cloth by feeling: but not immediately, for he requires to move fingers over the cloth, which shows that he is obliged to compare sensations of one instant with those of another" [18]. This surely suggests that abductive movements have also interesting extra-theoretical characters and that there is a role in abductive reasoning for various kinds of manipulations of external objects. All knowing is *inferring* and inferring is not instantaneous, it happens in a process that needs an activity of comparisons involving many kinds of models in a more or less considerable lapse of time.

Gooding refers to this kind of concrete manipulative reasoning when he illustrates the role in science of the so-called 'construals' that embody tacit inferences in procedures that are often apparatus and machine based. The embodiment is of course an expert manipulation of objects in a highly constrained experimental environment, and is directed by abductive movements that imply the strategic application of old and new *templates* of behaviour mainly connected with extra-theoretical components, for instance emotional, esthetical, ethical, spiritual, and economic [19].

Various templates of manipulative behavior in scientific reasoning exhibit some regularities. The activity of manipulating external things and representations is highly conjectural and not immediately explanatory: these templates are hypotheses of behaviour (creative or already cognitively present in the scientist's mind-body system, and sometimes already applied) that abductively enable a kind of epistemic 'doing'. Hence, some templates of action and manipulation can be selected in the set of the ones available and pre-stored, others have to be created for the first time to perform the most interesting creative cognitive accomplishments of manipulative abduction.

The whole activity of manipulation in Science is devoted to building various external *epistemic mediators.* (This expression is derived from the cognitive anthropologist Hutchins [11], who coined the expression 'mediating structure' to refer to various external tools that can be built to cognitively help the activity of navigating in modern but also in 'primitive' settings.) Any written

procedure is a simple example of a cognitive 'mediating structure' with possible cognitive aims, so mathematical symbols and diagrams: "Language, cultural knowledge, mental models, arithmetic procedures, and rules of logic are all mediating structures too. So are traffic lights, supermarkets layouts, and the contexts we arrange for one another's behaviour. Mediating structures can be embodied in artifacts, in ideas, in systems of social interactions […]" [11, p. 290] that function as an enormous new source of information and knowledge. Therefore, manipulative abduction represents a kind of redistribution of the epistemic and cognitive effort to manage objects and information that cannot be immediately represented or found internally (for example exploiting the resources of visual imagery). It is difficult to preserve precise spatial and geometrical relationships using mental imagery, in many situations, especially when one set of them has to be moved relative to another.

Let us come back to the problem of moral reasoning and moral deliberation I introduced in the first two sections above and so to the role of what I call *moral mediators*. Not only researchers in epistemology but also researchers in ethics stress the attention on the role of *imagination* respectively in scientific reasoning and in ethical thinking and deliberations. If we interpret 'imagination' just as the process of knowledge gathering and shaping we have illustrated above, it can be seen as a process which promotes new cognitive chances leading to *see* things *as* we would not otherwise have seen them. To see a 'moral world' means to see the world in an *original* way: ethical understanding involves coming to see some aspects of reality in a particular way that influences human cognitive and spiritual acting in shaping and surviving the future.

Suggestions in describing this dynamical process also come from a theory developed in the area of computer vision: the *active perception* approach [19]. This approach aims at understanding cognitive systems in terms of their environmental *situatedness*: instead of being used to build a comprehensive inner model of its surroundings, the agent's perceptual capacities are simply used to obtain whatever specific pieces of information are necessary for its behaviour in the world. The agent 'constantly adjusts its vantage point', updating and refining its procedures, in order to uncover a piece of information. This means specifying how to efficiently examine and explore, and thus interpret, an object of a certain type. It is a process of attentive and controlled perceptual exploration by which the agent is able to collect the necessary information: a purposefully moving through what is being examined, actively picking up information rather than passively transducing [20]. The world is actively explored rather than passively registered.

This description, used in analyzing both perceptual and imaginative activity can be useful in eliciting the cognitive processes underlying 'moral imagination'. "Moral principles without moral imagination become trivial, impossible to apply, and even a hindrance to morally constructive action" [21]. This means that in ethics analogical and metaphorical reasoning is very important, because of its capacity to 're-conceptualize' the particular situation at hand. Consequently, model-based tools for ethical deliberations should not be

considered negative, as subjective, free flowing, creative processes not governed by any rule or constrained by any rationally defined concepts so that we are led to see imagination as an enemy of morality. The role of a sort of a model-based imaginative activity is clear, for instance, in the *Critique of Pure Reason*, where Kant clarifies the importance of *intermediate* thinking devices able to make human beings capable of linking abstract principles to the real world of experience (cf. the case of the role of imagination in geometrical construction). Relating the discourse to moral rules, Kant develops the idea that a pure moral rule (as a maxim of action) is applied to the concrete experience as a kind of 'typification' – a sort of figurative substitute [22]. This typification could be interpreted as a kind of *figurative envisioning* of a non existing world as a means for judging a given moral situation. Kant denies that this typification involves imagination, for he maintains moral judgment a matter of pure practical reason, but, as Johnson concludes, "what could be more thoroughly imaginative than this form of figurative envisioning that is based on a metaphoric mapping?" [21]. It is through this kind of typification that chance production and promotion is enhanced in ethics. How does this occur?

Beyond rules and principles, hence, also prototypes, schemas, frames, and metaphors are vehicles of model-based moral knowledge, sometimes very efficient when facing moral problems. For example, morality as a grammar represents a typical metaphorical 'prototype' exploited in ethics: grammatical principles are in analogy to moral principles like in the simple case of 'speaking well' and 'acting well'; action as a metaphorical 'motion' leads to the idea that moral principles would be rules telling us which 'action-paths' we may take, which ones we must take, and which we must never take [21]. When looking for consequences of our moral actions and deliberations, this envisioning of a non existing world as a means for judging a proposed action can be performed in a model-based way.

As already described, a particular kind of model-based reasoning, I have called 'manipulative', occurs when we are thinking 'through' doing and not only, in a pragmatic sense, about doing. We have seen it resorts to a kind of exploitation of external objects and representations, and refers to an extra-theoretical (distributed) behaviour that aims at creating communicable accounts of new experiences to integrate them into previously existing systems of experimental and linguistic (theoretical) practices. It is difficult to establish a list of invariant behaviours that are able to illustrate manipulative reasoning in ethics. Certainly the expert manipulation of non-human objects in real or artificial environments implies the application of old and new *templates* of behaviour that exhibit some regularities. In is important to note these templates are embodied and implicit, as tacit forms of acting: we are not referring here to the moral actions and manipulations that simply follow previous explicit and devised plans. Anyway, this moral activity is still conjectural: these templates are embedded hypotheses of moral behaviour (creative or already cognitively present in the people's mind-body system, and ordinarily applied) that enable a kind of moral 'doing' to extract new ethical and spiritual chances. Hence, some

templates of action and manipulation can be *selected* in the set of those available and pre-stored, others have to be *created* for the first time to perform the most interesting accomplishments of manipulative moral inference.

3.2.1. Templates of moral action

Some common features of these 'tacit' templates that enable us to manipulate external human and non-human things and structures to achieve new moral effects and new ethical chances are related to:

1. sensitivity to the aspects of the moral situation which can be regarded as *curious* or *anomalous*; manipulations can also be performed which can introduce potential inconsistencies in the received knowledge (we suddenly adopt a different embodied attitude with respect to our wife/husband to get some reactions we can regard as interesting – or 'unexpected' – to confirm or discard hypotheses about her/his feelings or to develop further hypotheses about them; in an investigation about a crime we spontaneously engage further manipulations of the evidence to get more interesting data to morally shape the suspect);
2. preliminary sensitivity to the *dynamical* character of the situation at hands, and not only to entities and their properties, a common aim of manipulations is to practically reorder the dynamic sequence of the events correlated to the main problem to promote the subsequent possibility of new possibilities and options for action (a woman facing the decision in favour of abortion spontaneously tries to modify the dynamical aspects of her behaviour and the structure of her human relationships to try to establish new perspectives helping her to envisage a possible decision different from the first one first envisaged);
3. referral to manipulations that exploit *artificial* created feelings and environments to free new possibly stable and repeatable sources of information about hidden moral knowledge and constraints (when dealing with the moral problem of capital punishment we can spontaneously handle people, for example with statistics, interviews, scientific research, associations, to artificially reconfigure social orders - on the reconfiguration of social orders that is realized in science laboratories [23] - in a way suitable to get real and not hypocritical information, for example about the real relief generated in the victim's relatives by killing the criminal);
4. various contingent ways of spontaneous moral acting and moral chance building: *looking* from different perspectives, *checking* the different information available, *comparing* subsequent events, *choosing*, *discarding*, *imaging* further manipulations, *re-ordering* and *changing relationships* in the world by implicitly *evaluating* the usefulness of a new order (for instance, to help memory) (in the ethical case they certainly are all useful ways for getting suitable evidence and for stimulating the derivation of further opportunities to test our previously established moral judgments;

other manipulative templates analogous to the previous ones are active in chance discovery settings, as illustrated in [24].

More features of our tacit templates and ethical mediators are related to the following additional issues:

5. moral spontaneous action that can be useful in presence of *incomplete* or *inconsistent* information – not only from the 'perceptual' point of view – or of a diminished capacity to morally act upon the world: it is used to get more data to restore coherence and/or to improve deficient knowledge;
6. action as a *control of sense data* illustrates how we can change the position of our body (and/or of the external objects) to reconfigure social orders, collective relationships, and how to exploit various kinds of artificially created events to get various new chances of stimulation: action provides some tactile, visual, kinesthetic, sentimental, emotional, and bodily information (e.g, in taking care of people, cf. below in the following subsection), otherwise unavailable;
7. action enables us to build new *external artifactual models* of ethical mechanisms and structures (for example through 'institutions') instead of the corresponding 'real' and 'natural' ones. For instance, we can temporarily substitute the 'natural' structure 'family' with an environment which offers new chances to agent's moral needs. In this case we aim at reconfiguring relationships for instance when we exploit the social reshaping role of the 'houses' where children molested inside family are recovered, to rebuild their moral perception in a whole artificial framework, for example of the sexual molestation received and of the related bad feelings. Something similar occurs in the case of addicted people. We also establish structures to implicitly favour new chances of good manners, for example fences, barriers in the lines, etc.

As we have just seen, the whole activity of manipulation is therefore devoted to build various external *moral mediators* that function as an enormous new source of chances and opportunities, a kind of redistribution of the moral effort through managing objects and information in such a way that we can overcome the poverty and the unsatisfactory character of the moral options immediately represented or found internally. It is clear by this description how this kind of *manipulation* helps human beings in imaging their world. Moral mediators play an important role in reshaping the ethical and spiritual worth of human beings and collectives. For example they especially involve a continuous reconfiguration of social orders aiming at discovering and rebuilding new possible *moral chances* and world views.

3.2.2. Moral mediators

We have seen that the whole activity of manipulation is also devoted to building various external *moral mediators* (I derive this expression from the one 'epistemic mediators' I introduced in [5, chapt. 3]: these consist of external representations, objects, and artefacts that are relevant in scientific discovery and

reasoning processes) that function as an enormous new source of information and knowledge. We have just observed that these mediators represent a kind of redistribution of the moral effort through managing objects and information in such a way that we can overcome the poverty and the unsatisfactory character of the moral options immediately represented or found internally (for example exploiting the resources in terms of merely internal/mental moral principles, utilitarian envisaging, and model-based moral reasoning).

Not only a way for moving the world to desirable states, action performs a moral and not just merely performatory role: people structure their worlds to simplify and solve moral tasks when they are in presence of incomplete information or possess a diminished capacity to morally act upon the world when they have insufficient opportunities to know. *Moral mediators* are also used to exploit latent constraints in the human-environment system. These elicited new constraints grant us additional and precious ethical information and promote chance production and discovery: when we spontaneously act in a way in which we spend more quality time with our partner to save our marriage, then our actions automatically cause variables relating to 'unexpected' and 'positive' contents of the relationship to covary with perceptible new released informative, sentimental, sexual, and, in general, bodily variables. Prior to the adoption of the new reconfigured 'social' order of the couple, there is no active constraint between these hidden and overt variables causing them to carry information about each other.

Also natural phenomena can play the role of external artefactual moral mediators. Many external things that usually are (or in the past were) inert from the moral point of view can be transformed into moral mediators. For example we can use animals to depict new moral features of living objects previously unseen, as we can do with earth or (non natural) cultural objects; we can also use external 'tools' like writing, narratives, others persons' information, rituals, various kinds of pertinent institutions to reconfigure previously given social orders morally unsatisfactory. Hence, not all of the moral tools are inside the head, many of them are shared and distributed in external objects and structures which function as ethical devices.

The external moral mediators are endowed with functional properties as components of a memory system crossing the boundary between person and environment (for example they are able to transform the tasks involved in allowing simple manipulations that promote further moral inferences at the level of model-based abduction): I can only enhance my bodily chances to experience pain through action by following the template *control of sense data*, we previously outlined, that is through changing – unconsciously – the position of my body and its relationships with other humans and non-humans embedded in distressing experiences. In many people moral training is often related to these kinds of spontaneous (and 'lucky') manipulations of the control of their own body and sense data so that they build their morality immediately and non reflectively 'through doing'.

Women taught all human beings the importance of attitudes that emphasize intimacy, caring and personal relationships. This model looks at moral life as "a continuing negotiation *among* people, a socially situated practice of *mutually* allotting, assuming, or deflecting responsibilities of important kinds, and understanding the implications of doing so" [25]. Or course this is contrasted to the so-called "theoretical-juridical conception of morality". It would seem that women's basic moral orientation is 'taking care' of others and of external things in a personal way, not just being concerned by humanity or by the world in general. The ethics of care does not consider 'obligation' as essential; moreover, it does not require that we impartially promote the interests of everyone alike. It looks on small-scale relationships with people and objects, so that it is not important to 'think' to help disadvantaged children in all the world (like men aim at doing) but to 'do' that when needed, just 'over there'.

In light of my philosophical and cognitive treatment of the problem of moral model-based thinking and of morality 'through doing', this female attitude does not have to be considered as less rational and deontological because more related to emotions and passions, in turn intended as forms of lower level of thinking. I contend that we can become 'more loving parents' in a more intuition and feeling oriented way because of the reasons - and may be because of 'Kantian' rules – that compel us to educate our feelings in that way, and so to privilege the 'taking care' of our children in certain situations. The route from reason to feeling (and of course also from feeling to reason) is continuous in ethics.

Consequently, 'taking care' is a 'different' way of looking at people and objects, and, as a form of morality immediately given 'through doing', is clearly integrated and explained as a fundamental kind of moral inference and knowledge. Ethics of care, indeed, relates to the habit of terminating some people's urgencies by performing a 'caring perception' of non-humans (objects inside the house, for example). Consequently, these non-humans can easily be seen as 'moral mediators' in the sense that I give to this cognitive concept.

When I clean my computer I take 'care' of it by contemplating its economical and instrumental worth and its worth as a tool for other humans. When I use my computer as an epistemic or cognitive mediator for my research or didactic activities I am considering its intellectual prosthestic worth. If we want to respect people as we respect computers, in these two cases we can learn and stress different moral features about humans: 1) humans are biological 'tools' who embed economical and instrumental values, I can 'use' a human to learn things, and its know how (like in the case of the hard disk with its software) – so humans are instrumentally precious for other humans in sharing skills of various kinds; 2) humans are skilful cognitive problem solvers who embed the moral and intrinsic worth of cognition.

4. Conclusion

It is clear that the manipulation of external objects helps human beings in chance discovery and production and thus in their creative tasks. I have illustrated the strategic role played by the so-called traditional concept of 'implicit knowledge' in terms of the recent cognitive and epistemological concept of manipulative abduction, considered as a particular kind of abduction that exploits external models endowed with delegated cognitive roles and attributes. Abductive manipulations operate on models that are external and the strategy that organizes the manipulations is unknown *a priori*. In the case of 'creative' manipulations of course the result achieved is also *new*, and adds properties not previously contained.

I have described various 'templates' of manipulative behaviour which account for the most common cognitive and epistemic behaviours related to chance discovery and chance production. We have stressed the importance of producing inconsistencies by radical innovation at the level of internal abductive processes but also in the case of manipulative thinking, where epistemic mediators constitute interesting ways of finding anomalies and 'curious' events, unexpected dynamical features of phenomena, contingent ways of epistemic acting, and manage incomplete data and information to anticipate new trends and hidden objects and properties.

By exploiting the concept of 'thinking through doing' and of manipulative abduction I have tried to shed new light on some of the most interesting cognitive and spiritual aspects of creative ethical reasoning of what I call 'moral (or ethical) mediators'. Indeed, I contend that the whole activity of manipulation can be seen as an activity for building various external 'ethical mediators' that function as an enormous new source of information and knowledge and of chance extraction and production. Furthermore, while describing morality 'through doing' a list of 'moral templates' as forms of invariant behaviours that are able to illustrate manipulative ethical cognition is furnished. These templates are forms of behaviour which are inclined towards providing ethical outcomes. The application of old and new (creative) moral templates of behaviour exhibits some regularities and expresses expert manipulation of human and non-human objects in real or artificial environments. These templates are embodied and implicit as tacit forms of acting which prefigure new ethical chances. They are embedded hypotheses of moral behaviour (creative or already cognitively present in the people's mind-body system, and ordinarily applied) that enable a kind of moral 'doing'. Hence, some templates of action and manipulation can be selected in the set of those available and pre-stored, while others have to be created for the first time in order to perform the most interesting accomplishments of manipulative moral inferences. These 'tacit' templates enable us to manipulate external human and non-human things and structures to achieve new moral effects and new ethical chances.

References

[1] J. Rachels, *The Elements of Moral Philosophy*, McGraw-Hill College, Boston, 1999, 19.

[2] L. Magnani, *Morality in a Technological World. Knowledge as Duty*. Cambridge University Press, Cambridge, 2007.

[3] A. Thomson, *Critical Reasoning in Ethics.* Routledge, London, 1999, 33.

[4] E. Millgram (ed.) *Varieties of Practical Reasoning*. MIT Press, Cambridge (MA), 2001.

[5] L. Magnani, *Abduction, Reason, and Science. Processes of Discovery and Explanation.* Kluwer Academic/Plenum Publishers, New York, 2001.

[6] L. Magnani, *Abductive Cognition. The Epistemological and Eco-Cognitive Dimensions of Hypothetical Reasoning*. Springer, Heidelberg/Berlin, 2009.

[7] L. Magnani, *Epistemic mediators and model-based discovery in science*. in *Model-Based Reasoning: Science, Technology, Values*, L. Magnani & N.J. Nersessian (eds.), Kluwer Academic/Plenum Publishers, New York, 2002, 305-329.

[8] T. Bylander, D. Allemang, M.C. Tanner and J.R. Josephson, Artif. Intell., **49** (1991) 25-60.

[9] C. Boutilier and V. Becher, Artif. Intell., **77** (1995) 43-94.

[10] M. Polanyi, *The Tacit Dimension.* Doubleday and Co, New York, 1966.

[11] E. Hutchins, *Cognition in the Wild,* MIT Press, Cambridge (MA), 1995.

[12] N.J. Nersessian, *Model-based reasoning in conceptual change*. in *Model-Based Reasoning in Scientific Discovery*, L. Magnani, N.J. Nersessian, & P. Thagard (eds.), Kluwer Academic/Plenum Publishers, New York, 1999, 5-22.

[13] D. Gooding, *Experiment and the Making of Meaning.* Kluwer, Dordrecht, 1990.

[14] H.A. Simon, *Models of Discovery and Other Topics in the Methods of Science.* Reidel, Dordrecht, 1977.

[15] K. Dunbar, *How scientists think: online creativity and conceptual change in science,* in *The Nature of Insight*, R.J. Sternberg & J.E. Davidson (eds.), MIT Press, Cambridge (MA), 1995, 365-395.

[16] L. Magnani, *Thinking Through Doing. External Representations in Abductive Reasoning*, Proc. of AISB 2002 Symposium on AI and Creativity in Art and Science. Imperial College, London, 2002, 21-28.

[17] J. Zhang, *The nature of external representations in problem solving*. Cognitive Science, **21(2)** (1997) 179-217.

[18] C.S. Peirce, *Collected Papers*, C. Hartshorne & P Weiss (eds.), vol. V, Harvard University Press, Cambridge (MA), 1934, 221.

[19] N.J. Thomas, Cognitive Science, **23(2)** (1999) 207-245.

[20] J.J. Gibson, *The Ecological Approach to Visual Perception*, Houghton Mifflin, Boston, 1979.

[21] M. Johnson, *Moral Imagination. Implications of Cognitive Science in Ethics*. The University of Chicago Press, Chicago, 1993, 43.

[22] I. Kant, *Critique of Practical Reason*, English translation by L.W. Beck, Bobbs-Merrill, Indianapolis, 1956.

[23] K. Knorr Cetina, *Epistemic Cultures. How the Sciences Make Knowledge.* Harvard University Press, Cambridge (MA), 1999.

[24] L. Magnani, M. Piazza and R. Dossena, *Epistemic mediators and chance morphodynamics*, Proc. of PRICAI-02 Conference, II Workshop on Chance Discovery, University of Tokyo, Tokyo, 2002, 38-46.

[25] M. Urban Walker, *Feminist skepticism, authority and transparency*, in *Moral Knowledge? New Readings in Moral Epistemology*, W. Sinnott-Armstrong and M. Timmons (eds.), Oxford University Press, Oxford, 1996. 267.