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Sculpting the space of actions: explaining human action by integrating intentions and mechanisms

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4 DISTAL INTENTIONS: GOVERNING THE INTENTIONAL CASCADE?*

Based upon ample professional and personal experience, our expert singer knows how to use his voice and body optimally when he tries to seduce Zerlina. A sculpted space of actions allows him to flexibly and without much thinking use the stage-props at hand while interacting with her – his cape and sword, perhaps a scarf that Zerlina is wearing, and so on. Proximal intentions help him to anchor his Don Giovanni performance in the context of this particular stage and specific interpretation, while implicit motor intentions facilitate at a finer grain his making appropriate manipulations of the props and convincing vocal expression of the score. Given the constraints that determine his sculpted space during a performance, he need not be constantly reflecting on his action options. He need not to put effort in looking away from the female singer and up to the heaven since he is not playing the celibatarian Saint François nor must he suppress aggressive or even suicidal tendencies when handling his sword since he is not impersonating Peter Grimes. Instead, he presents a juvenile and heroic character with the corresponding motor and vocal performances without requiring much awareness. That is, if he is to perform as he is used to do, as he has seen others doing and as he believes it should be done.

On stage as in everyday life, however, things do not always go as they normally do. A stage director comes along with a revolutionary interpretation, a conductor wants to show the score in a surprisingly new light, or our singer himself is not convinced that he should just repeat his earlier performances. As a result of either of these interventions, Don Giovanni is now required to behave shy, not take his sword but a pencil in the hand and sing with a somewhat throaty voice. This would require our singer to exert careful control of his performance, demanding perhaps some extra rehearsal time as it implies that he needs to suppress habituated actions, to anchor his role anew in the specific situation and then to practice these new and alternative actions so well that he can perform them and meanwhile attend to the conductor, intonate properly with Zerlina, and so on. Being a professional singer, he has established a distal intention to comply with a new direction and the actions that are determined by it, now working hard to specifically adjust his proximal and motor intentions where necessary. A reconfiguration of his sculpted space of actions is required for that.

But sometimes an experienced agent is forced to more than modify his space of actions in a habituated situation. It is not hard to imagine a stage director who wants to

* On pages 371, 373, and 375, figures I, II, and III offer simplified representations related to the arguments made in Parts I, II, and III respectively. Fig. III is particularly relevant as a representation of the main contents of section III.4.

portray Don Giovanni as an immoral, egocentric rapist and asks our singer to behave accordingly, to attempt to strangle and violently undress Zerlina, to walk around half-naked and to sing with a harsh and chilly voice. If so, we can imagine our expert singer not willing to conform to this interpretation, as he may have fundamental objections against it. He may have artistic objections against this excessive interpretation, may be too prude or insecure to undress himself, may want to avoid harming his voice or may fear to alienate his wife from himself when she would see his performance, for example. In these cases one or more distal intentions that happen to govern over a longer period of time his personal and artistic life can make him decide not to accept the role this time.

Perhaps, he at first thought that things would turn out not so bad, only to find out during the first rehearsals that the direction was even more ridiculous than he thought, that he indeed felt strongly embarrassed or that he disliked singing as he was required to do. Upon having experienced how he would need to specify and anchor his actions during a scene rehearsal, then, he would be certain of his decision not to comply with this interpretation even though he usually let himself be guided by a director. He would then know that it would demand him to not only block the application of some of his distal intentions in this exceptional case but that it would force him to transgress the limits of the space of actions associated with these intentions. More than just a matter of having to control and adapt his habituated actions he would need to perform such that he would feel like betraying himself. At least, that is how the situation appeared to him after sufficient reflection upon his first response and the experiences during the first rehearsal. Indeed, even an extensive discussion with the director and a colleague friend could not deflect him of his decision, of which he now is certain.

This episode from an artist's life shows us how an agent's performance is constantly determined by the simultaneous influence of intentions that operate at very different levels of grain. It also demonstrates how difficult it can be to eventually settle for a particular action when it seems impossible to act in such a way that coherence between the three levels of intentions obtains. It may take an agent a while to at first set aside his feeling of uneasiness, then to experience personally his embarrassment which strengthens his initial feeling and finally to decide to stand behind his objections. Unfortunately, this process is often necessary as there are no strict laws or rules that determine which motor, proximal and distal intentions specifically cohere together and how, and which do not.

Indeed, we've observed that the intentional cascade model does leave the three levels of intention a certain leeway to each other, while it simultaneously provides top-down and bottom-up interactions. For example, we've discussed in section III.2.1

how an experienced agent will have established a set of repeatedly activated motor intentions that then respond differentially to specific environmental affordances with the prepotentiation of corresponding action responses. Given such prepotentiations, it is likely that in a given situation the anchoring of a distal intention will take place by executing one of these prepotentiated motor intentions instead of developing a novel one. That is, if the agent has not formed a distal intention that specifies an uncommon course of action that requires him to withhold this habitual response and to do something else instead, for which the proximal intentions discussed in section III.3.1 are involved.

Distal intentions play in both cases an important role, as they govern in some sense the development of an overarching action plan and are also involved in withholding an implicated habitual and choosing an alternative action instead. The latter could be necessary if the habitual action turns out not to fit an action plan, or if an agent is even modifying his action plans. Accordingly, distal intentions have been said to have three main roles: “as terminators of practical reasoning about ends, prompters of practical reasoning about means and plans, and intra- and interpersonal coordinators” (Pacherie 2008 182). The first role seems natural, as ends – especially long-term ends of a planning agent – transcend the specific environmental and corporeal conditions which we found in earlier sections to figure prominently in proximal and motor intentions. Therefore, ends that lie more in the future require other capabilities than involved in those latter intentions. The second role of distal intentions does refer to the fact that, still, for its realization an agent’s practical reasoning needs subsequently specify necessary means and plans. The third and final role is perhaps the most difficult one, as coordinating one’s actions can be a quite complex task.

Indicating this complexity, Pacherie distinguishes between three different forms of consistency which rely on distal intentions that are to be considered. First, the component actions involved in a distal intention should be internally consistent and not cross each other. Second, an agent’s distal intention should not contradict what he believes and thinks about the world, should be externally consistent. Third, global consistency is required for a distal intention to be integrated with his other action plans (Pacherie 2008).⁴²⁵ The question presents itself, how consistency across such different domains or contexts can be established, covering actions, beliefs and plans? What representational format lends itself for fulfilling this role?

⁴²⁵ Bratman does not make precisely this threefold distinction. He does discuss consistency constraints, but seems to limit these to what Pacherie calls the internal and external consistency constraints. However, he does then also acknowledge the “demands of consistency on my total web of intentions”, which amounts to Pacherie’s global consistency (Bratman 1987 32).

This question is not completely new as we've seen in the context of motor and proximal intentions that they require integration of specifics regarding muscle movements, situational affordances and about action goals. Different forms of information can be represented and processed by the brain such that they become associated with each other even though their differences – and the different processes in which they are involved – remain intact. In the present context, however, Pacherie claims that a shared representational format is necessary if distal intentions are to play their coordinating role. For she contends that for distal intentions to be able to function as consistency enhancing coordinators, they rely upon a “network of inferential relations among intentions, beliefs and desires.” According to the argument, it is the conceptual nature of distal intentions that allows such a network between intentional states to be developed: “[t]heir sharing a common conceptual representational format is what makes possible a form of global consistency, at the personal level, of our desires, beliefs, intentions and other propositional attitudes” (Pacherie 2008 184). Are we indeed to assume that distal intentions are fraught in a conceptual representational format and are to exert their determining role in the intentional cascade based upon a format that is potentially very different from the format of motor representations?

Within the context of the intentional cascade, this issue is not explicitly addressed. Elsewhere, however, Pacherie admits that the conceptual representation involved in a distal intention must be connectable or even convertible into appropriate motor representations if it is to be executed by way of an action. Even though, as we noted earlier, motor intentions are cognitively impenetrable they can become associated with the conceptual contents of intentions depending on an agent's experience with both the motor movements and the relevant concepts (Pacherie 2011).⁴²⁶ Here again, she leans on the work of Jeannerod, who has demonstrated that there is an equivalence between motor preparation and motor imagery and who “suggests that the same general framework used for simple object-oriented actions remains applicable to higher-order representations encoding long-term action plans” (Pacherie 2000 413).

Important aspects of that general framework are that actions are represented in a distributed way in the brain and that the representations are organized partly in a hierarchical way. Moreover, these representations are used more or less equally for

⁴²⁶ In a chapter written together with Haggard, Pacherie clarifies that forming a prospective intention – the term used there for distal intention – does in fact amount to the activation of mental representations of relevant environmental cues, for example. Given the association of such representations with relevant motor representations, a distal intention can indeed determine activation of non-conceptual representations as well (Pacherie and Haggard 2010). Supporting this analysis, the authors refer to the effectivity of implementation intentions in governing an agent's future actions (Gollwitzer and Sheeran 2006).

the execution, imagination and observation of actions, in which case representations are assembled from various motor action components. Jeannerod refers to that process as ‘motor simulation’ (Jeannerod 2006). However, he acknowledges that his account of motor simulation and its prevalence in various cognitive processes focuses on representations of motor actions only, leaving out many relevant aspects of the representation of actions – like the objects or tools that are involved in many actions. Furthermore, motor simulation in this account has a limited validity with regard to complex, temporally extended and hierarchically organized actions and to actions which require prior knowledge about the context and agent that are involved (Jeannerod 2006).⁴²⁷ If the approach is to be useful in this context, we therefore may need to take on an expanded version of it.

The reader may recall that in chapter II.4 ff. we discussed another simulation theory, that had a much larger scope as it was based upon the assumption that: “simulation constitutes a central form of computation throughout diverse forms of cognition, where simulation is the re-enactment of perceptual, motor and introspective states acquired during experience with the world, body and mind” (Barsalou 2009 1281; cf. Barsalou 2008). According to this theory, a simulation offers an assembly or reconfiguration of component representations that stem from previous sensory, motor or cognitive experiences and that have been stored in a highly distributed fashion across the brain. Unlike Jeannerod’s motor simulation theory, this simulation theory does not exclude domains of experience from being integrated in such a simulation.

On the contrary, although we found Barsalou’s simulation theory emphasizing the modal origin of ‘perceptual symbols’, it does acknowledge that humans even have the capability of producing abstract concepts or mathematical concepts by focusing attention on or reassembling particular components of stored – modal – representations for which language is important (Barsalou 1999c). In much the same vein humans can employ language for configuring the representation of a potential situated action by engaging not only the areas in which relevant sensory and situational information is stored, but also areas that are involved in motor control (Pezzulo, Barsalou et al. 2011).⁴²⁸ What we’ve learnt in Part II about the phenomenon of the re-description

⁴²⁷ It appears that Pacherie has not really faced these limitations of Jeannerod’s account when developing her own. In another article on ‘The content of intentions’ she offers a short reflection on the perception and processing of ‘scenario-content’ and ‘protopositional content’ and connects this to a reflection on the representation of basic action concepts (Pacherie 2000). What she does not offer is an analysis of how especially distal intentions can contain representations of a variety of contents, objects, and actions.

⁴²⁸ This simulation theory does not only offer a theory of grounded concepts but also leaves room for a reverse influence, in which case a simulation results from focusing attention on a particular concept, for example (Barsalou 2009; Barsalou, Cohen et al. 2005).

of representation is therefore something that is not restricted to early stages in child development or learning, but is facilitated by language in a more general sense.

Important to note with regard to our interest in an agent's sculpted space of actions is that one may think of a simulator as not producing just a single simulation of a concept or situation. Instead, it is argued that "the space of possible simulations within a simulator is as a space of Bayesian priors, with some simulations being more likely than others" (Barsalou 2011 191). This conception of a sculpted space in which some options are more probable than others concurs with the theory regarding interactive activations of hierarchically organized action representations (Cooper and Shallice 1997 ; Norman and Shallice 1986) that was found to be helpful in explaining the functional roles of proximal intentions.⁴²⁹ However, the simulation theory does even extend the latter theory, as it is explicit about the fact that all kinds of components – modal and amodal or abstract - of a simulated action are stored in a distributed way throughout the brain and can be configured through imagination or speech and consequently influence future cognition and behavior (Barsalou 1999a). A consequence of that extension is that it also contends that a simulator can be supported by a wide variety of neural areas depending upon the introspection involved (Barsalou 2003) or whether novel and unrealistic situations are being simulated (Barsalou 1999c). With all these areas and processes involved under the influence of previous experience, there is a distinct advantage for experts over novices. In experts a sculpted space, containing more and richer simulations, will be activated in specific situations, subsequently facilitating in a flexible way a fast and adequate action response (Barsalou 2009).⁴³⁰

With these preliminaries in place, we may ask in what sense this process of developing a simulator, for example by formulating a distal intention, is subject to constraints or not. For in line with our arguments so far, it is to be expected that a distal intention can play its role in coordinating actions both at a personal and an inter-personal level best if such constraints have been developed in the context of distal intentions as well. If this were not the case and the constraints corresponding to

⁴²⁹ Again, as was the case in the comparison with Jeannerod's simulation theory, Barsalou's theory of simulation aims to account for the infinity of complex and recursive configurations that can be made available through selective attention and language, among others (Barsalou, Simmons et al. 2003).

⁴³⁰ As has been noted earlier, it is debatable to which extent experts may have a disadvantage in coming up with novel and creative solutions given the presence of a sculpted space which may predetermine their responses. If, however, creativity is taken to depend upon the recognition of relevant dimensions of a problem space in order to develop a useful novel solution – as Boden has argued in her influential (Boden 2004) – then we can expect those to come from an expert rather than from a novice. This is not to deny that an expert may have more difficulty in suppressing solutions that have become habituated, whereas novices are not burdened with that difficulty. This is captured nicely in the saying: "Children love kitsch but make art whereas adults love art but make kitsch" – as adults often prefer modern art but have hesitations to express themselves as directly and unpolished as children do.

a sculpted space would only emerge from motor and proximal intentions, the question is whether such constraints would be sufficiently coordinating actions and would be sufficient in providing maximal coherence and consistency in an expert's actions.

Let us start by scrutinizing more in detail distal intentions's role in determining and coordinating actions is articulated by Bratman and then turn again to empirical findings that bear upon this role.

4.1 A philosophical analysis of distal intentions

In section III.2.0 we referred to Grice's and Bratman's exercises in creature construction in which both drew increasingly complex creatures as a way of demonstrating what adding further capabilities implies for their functioning. The creatures that Bratman presents develop already in their fourth – of eight - stage planning capacities, under the pressure for coordination and organization both of its individual actions and its interactions. Irrespective of moral issues it is the possibility that any action can be counter-productive or costly in multiple senses, that planning agency was found to be required to contribute to increasing coherence. However, planning turns out to be more complex than at first realized in the planning Creature 4, as successful planning requires ever more conditions to be fulfilled. In successive steps, therefore, planning agency is expanded such that it involves the capability to develop a hierarchical structure for its intentions, a structure that is partly determined by a reflective valueing. Through this reflective valueing it is governing not just its actions but also its intentions and desires, yielding self-governing policies with which it can not only organize but even justify favoring some over other of its desires and intentions (Bratman 2006b, ch. 3).

This suggests that an agent equipped with a self-governing policy must constantly engage in self-reflective deliberation about his intentions for action. However, this would contradict our observation earlier, in the context of motor and proximal intentions, that the development of a sculpted space of actions allows an agent to act in most situations fast and flexibly without demanding costly deliberation and reconsideration. Consequently, the question is whether and if so, what, a self-governing policy can contribute to this space and under what conditions an agent should spend time and resources on deliberatively further sculpting his space of actions. On the basis of the reflections on distal intentions above we can already predict that they probably must rely upon a rather complex set of capabilities, with equally complex neural underpinnings. The latter, though, will be our topic only later.

4.1.1 Closing the gap between distal and proximal intentions and sculpting the space of actions

In most situations, multiple affordances for a motor action are available for an agent and equally more than just a single proximal intention can be realized. Constraints could be helpful in assisting an agent to escape from being paralyzed and unable to choose which action to perform or, conversely, from performing actions that are counter-productive and incoherent with his other actions. These constraints should sculpt his space of actions such that in each situation the probability for most actions of being executed is decreased, while eventually a particular action option – constituted by a certain configuration of action components – is executed. As we have seen earlier, experience contributes a lot to the development of such constraints via processes like information chunking, association formation between perceptual information and motor responses, and kludge formation that facilitates habitual action in common situations. Over time, these constraints facilitate processes like contention scheduling and the supervisory control of action to proceed relatively fast and flexibly, with minimal taxing of the agent's cognitive resources.

However, if his sculpted space of actions were to be only constrained by way of his experience and the corresponding motor and proximal intentions, the agent would face two difficulties with regard to the distal intentions that he has developed or will formulate in the future. First, if his distal intentions would not be somehow integrated in his sculpted space, their practical anchoring, specification and realization through associated proximal and motor intentions would likely be impeded. If each distal intention would be new to an agent's sculpted space, such anchoring, specification and realization would always require the top-down establishment of novel associations with proximal and motor intentions. Given bottom-up influences, like the prepotentiation of motor intentions as a response to perceived affordances, the execution of a completely new distal intention might then also require the inhibition of motor and proximal intentions that figure prominently in an expert's sculpted space of actions. Second and related to this, developing distal intentions does not yet protect an agent from committing incoherencies. Particularly because of the agent's capability to execute complex intentions that imply component actions across time and space, potentially engaging other agents as well, his sculpted space of actions may not yet be sufficient for helping him to avoid incoherencies and creating coherency. As Bratman's account of planning agency is particularly aiming to elucidate how organization and coordination of actions is established, we will consider how he thinks we can aim to close this gap with distal intentions.

Now distal intentions – Bratman's future-directed intentions – are meant to answer

two human needs, the first of which points more to a limitation, the second rather to a capability. For it is because of our limitations in terms of time and cognitive resources that we cannot always rely upon deliberation during a particular situation to see whether it is suitable for developing a proximal intention, and if so what. Apart from this limitation, it is our capability of realizing complex goals that requires additional intrapersonal and inter-personal coordination. Distal intentions are involved not only in planning such complex goals but also in the associated coordination role (Bratman 1987). It may be tempting to think that an agent should then be as specific and concrete as possible when forming an intention at a place and time that is 'distal' to situations in which concrete actions have to be performed. However, such comprehensive planning is practically impossible and would deny the unpredictabilities of reality, like the unpredictability of another agent's behavior. Instead, planning agents' plans are usually incomplete: "we typically settle on plans that are *partial* and then fill them in as need be and as time goes by" (Bratman 1987 3, italics in original). This leaves distal intentions in an ambiguous position, being involved in planning and coordinating, while leaving much of those functions to later moments, when proximal intentions have a crucial role in such filling in or specification.

The consequence of that peculiar position is that a distal intention does enforce an agent to further deliberate upon his intention, now or at a later stage. Fortunately, it does so not without offering resources to constrain that process. Depending upon the comprehensiveness of a distal intention, he must start to specify and plan the means to reach the intended end at an early stage: intending as a child to become an expert singer requires longer preparations with many more intermediate actions than intending to be on time in the opera house tomorrow. In both cases, however, the distal intention does provide some resources for constraining the necessary deliberations, according to Bratman: a distal intention can also play a role as a 'filter of admissibility for options' and offers 'standards of relevance for options', which makes the admittance of options and a subsequent selection between them more feasible (Bratman 1987 33).

This role is especially played by those distal intentions that are integral to a characteristic component of this account of planning agency and probably also quite relevant for our sculpted space of action: a person's policies. An agent typically has such policies, which consist of a habitual way of acting in or responding to recurring situations. Our expert singer, for example, may have as a policy to avoid smokey places the night before a performance. Such a policy then constrains and guides his further deliberation about distal intentions, like his joining his colleagues after tomorrow's show at a party.⁴³¹ Having a general policy is therefore useful for three reasons, according to Bratman's account. First, it solves the problem of our limited time and

resources as it has his deliberation influence his intention formation at a later moment. Second, it simultaneously helps in interpersonal and intrapersonal coordination. Finally, it invites an agent to focus on and decide about comparable situations as it “may sometimes be easier to appreciate expectable consequences (both good and bad) of general ways of acting in recurrent circumstances than to appreciate the expectable consequences of a single case” (Bratman 1987 88). The fact that similar situations occur repeatedly allows a planning agent to alleviate his future deliberative efforts, it seems, and nonetheless increase the consistency in his actions.

What such a policy brings about, then, is constraining an agent’s distal and – with that – proximal intentions by constraining the deliberation that is involved in the formation of these intentions. Consequently, in a case when a distal and proximal intention are based upon a policy, there is not ‘full-blown deliberation’ of all possible action aspects involved (Bratman 1987 90). Such deliberation is no longer necessary as in recurrent circumstances the relevant aspects of a situation and the corresponding action consequences can be predicted based upon previous experiences. The policy is in such a case ‘*circumstance-triggered*’, Bratman argues, and we may add that the corresponding, policy-based intentions do not require further deliberation (Bratman 1987 88, italics in original). With regard to such proximal intentions, we learnt above that in an exceptional case an agent may feel forced to for once block the application of his general policy – for example when he does not buckle up in an emergency or when our singer decides once to deviate from his policy and joins his colleagues tomorrow at a birthday party at a smokey party. Recognition of the exceptionality of the current situation, based upon great expertise with recurrent normal situations is required to ignite the deliberation that is otherwise likely superfluous.⁴³²

This observation that a general policy may in exceptional circumstances be blocked – not rejected nor reconsidered, but just blocked – points to a fact that has not received yet much attention: the challenge for a planning agent to coordinate and organize multiple intentions and policies. Sure enough, we’ve noticed that a third form of consistency was included in the intentional cascade model, since global consistency

⁴³¹ With regard to the proximal intentions, we already discussed the possibility of blocking the application of our general policy – for example to buckle up during driving. In that case, it is not the policy that we reject or reconsider, but only its applicability in an emergency situation (Bratman 1987). The singer may similarly decide once to deviate from his policy and distally intend to join his colleagues tomorrow at a birthday party at a smokey party.

⁴³² Indeed, Bratman argues that based upon our habits and propensities we “take notice of certain sorts of problems but not of others – to treat certain aspects of the environment as salient” (Bratman 1987 65). Adequate expertise, so we argue, does also imply that an expert notices when the environment presents a situation that potentially outwits his habits and skills. More below, we will argue that imagination and narrative may be a means of preparation for such situations to the expert.

referred to the integration of a plurality of action plans and distal intentions (Pacherie 2008) or the consistency of his 'total web of intentions' (Bratman 1987 32). One would expect that this consistency does not require constant deliberation, too, but is maintained by the kind of dispositions that we've been considering in this section.

4.1.2 Hierarchy and stability of a planning agent's web of intentions

Not buckling up in an emergency situation or entering a smoky environment for a specific celebration implies that the agent's policy is blocked because another policy or distal intention has now been given priority: saving someone's life or affirming a friendship. In such cases it becomes apparent that an agent usually has adopted multiple policies, which can conflict with each other. This requires an agent – striving to avoid costly and counterproductive actions - to arrange his policies such that chances for conflict are diminished. The commitment to his policies cannot be equal but must therefore be differential.⁴³³

A planning agent is required to coordinate his policies with each other, which does require him to reflect upon them and systematically arrange them. In line with our arguments so far, it is to be expected that the arrangement of his policies will have a hierarchical structure – in addition to the hierarchical structure of his actions and plans. Only with such an arrangement will he be able to respond to coherently yet flexibly to both common and exceptional situations, according to his own intentions and plans. This is no longer just a matter of rational reflection or deliberation, but also a matter of 'valuing'. Assigning values to his policies and plans in such a way that priorities result can help to avoid or solve conflicts or inconsistency: "an autonomous agent not only governs her actions but also governs the practical reasoning from which those actions issue" (Bratman 2006b 164).⁴³⁴

What is required in addition to an agent's planning capacity is a 'motivational hierarchy' that can guide his planning or policy-making whenever necessary. Interestingly, Bratman argues that such a hierarchy cannot rest exclusively upon rational argument or deliberation, since it involves the assignment of values to the policies or higher-order intentions that are used in reasoning and deliberation. The

⁴³³ Frankfurt argues even that a person can only be genuinely free and willful, if he has identified with certain higher-order 'volitional necessities' or ideals. In that case, he must no longer reflect and reason about them, even though these guide his choices and autonomous actions: "Volitional necessity constrains the person himself, by limiting the choices he can make" (Frankfurt 1999 113).

⁴³⁴ Such conflicts are different from those that have to do with deliberation about means towards ends or reasoning about ends. More general conflicts stemming from an agent's commitments are meant here: "human agents are complex, and in many cases of interest, there is conflict among relevant practical attitudes" (Bratman 2006b 260).

hierarchy puts in place not just policies but higher-order policies or ‘self-governing policies’ that “say which desires are to have for the agent what we can call “subjective normative authority”” (Bratman 2006b 210). Surprising as it may be, we find here an argument for there having desires or ‘conative attitudes’ this normative authority and not only rational justifications.

This motivational hierarchy, that needs to be in place for a self-governing planning agent, is subject to a similar limitation that is relevant for his intentions and policies.⁴³⁵ Being still a temporally extended agent with highly limited resources and capabilities, he must avoid costly and counter-productive actions or reflections, which now implies that he should also avoid as much as possible reconsideration and revision of this hierarchy. If not, the ‘system of self-management’ would break down as bodily appetites, emotions and other motivating attitudes would “challenge and/or diverge from, our commitments to weights and other forms of significance” (Bratman 2006b 241). So even if his ‘satisfaction’ - which Frankfurt expects an agent to have with the structure of his will in order to be autonomous (Frankfurt 1999) - would be tempted, the agent should refrain from reconsidering or deviating from his motivational hierarchy.⁴³⁶

Interestingly, here again we find that it is reasonable for an agent not to constantly reconsider his intentions, reason about his policies, or reevaluate his underlying motivational hierarchy, since he would then lose time and resources and would probably perform counterproductive actions. If, instead, he would have established a sculpted space of actions that would also be constrained by his distal intentions and policies, this would “support some sort of defeasible, default presumption in favor of following through with one’s prior intentions and policies” as is being called for (Bratman 2006b 276).⁴³⁷ This raises the question how such higher-order constraints can be included in this sculpted space. Now that we’ve gathered support for such a sculpted

⁴³⁵ Concurring with the increasingly complex nature of the creatures in Bratman’s exercise in ‘creature construction’, he here argues that “a basic pressure for conative hierarchy derives from what is for human agents a pervasive practical problem of self-management” (Bratman 2006b 219).

⁴³⁶ In his reply to Bratman, Frankfurt reconsiders his formulations concerning the role of higher-order intentions and the identification with these intentions or the endorsement of such intentions by an agent. Frankfurt regrets these formulations since they suggest that the agent must attach a value to them or treat them as providing justification for his intentions, which is not what he meant. Indeed, in contrast to Bratman, Frankfurt doubts whether deliberation and practical reasoning are so important for human agency, partly since animals can have a form of agency without them (Frankfurt 2002c). We concur with Frankfurt’s reservations insofar that we argue that deliberation and practical reasoning need to be complemented with other capabilities like imagination or simulation, that may to in some form be shared with animals, to. Comparative studies suggest that some animals are indeed capable of simulation or ‘mental time travel’, as is being discussed in (Suddendorf and Corballis 2007) and its commentaries.

⁴³⁷ Moreover, it is not just the presence of intentions and policies that support non-reconsideration. There are also many nonreflective cases of non-reconsideration, due to ‘certain underlying habits, skills, and dispositions’ (Bratman 1987 60). Naturally, such habits, skills and dispositions are often the result of previous deliberation and reflection, as we’ve argued earlier and our example of the expert singer has testified. In addition, we will now also consider a role for simulation and narrative.

space, let us see whether this account of planning agency also offers suggestions for expanding it at this point.

4.1.3 A role for the imagination in weaving one's comprehensive web of intentions?

During our discussions of how motor, proximal and distal intentions and self-governing policies might be involved in an agent's sculpted space of actions, we have also noticed that their contributions to this space are to a large extent an effect of the habits, dispositions and attitudes that they lead to. That is, rational deliberation and argumentation play a limited and not an exclusive role in planning agency. There are in particular two functions, for which other resources might be useful, for developing a more comprehensive web of intentions and that perhaps in turn contribute to his sculpted space. First, it may be useful for an agent to gain some form of preliminary or preparatory expertise in anchoring and specifying his distal intention in various situations. A way to do this could be to imagine oneself in executing multiple proximal intentions that all appear to implement that distal intention. Second, rational arguments may not (alone) suffice to an agent's development of self-governing policies, without which he would have difficulty in giving priority of some of his policies over others. The necessary motivational hierarchy and values may therefore need another source or support. Here again, imagining oneself in a situation in which distal actions based upon some of his policies – with which an agent is otherwise satisfied – might lead to inconsistencies, could be a useful endeavour and challenge him to assign priorities. Unfortunately, however, the account of planning agency and the corresponding intentional cascade seems not to offer such resources, complementary to those that we have considered.

Now Bratman does acknowledge that an intention cannot always be decided upon in a straightforward way, even not against the background of an agent's established web of intentions and beliefs. For notwithstanding this background, there may still be acceptable and relevant alternatives available for a particular intention, each having different reasons for and against it. A first step is that an agent has at his disposal a further 'screen of admissibility' that helps him to rule out some intentions when they are considered against the background of other intentions. For an agent should "avoid functionally incompatible intentions" (Bratman 1987 162), that is: he should avoid having dispositions and intentions such that their simultaneous realization is impossible.⁴³⁸ The question is, however, how he can realize such global consistency when at the same time his distal intentions can be partial and be left open for future specification.

To be sure, planning agency does involve some anticipation of future consequences of intentions. For example, in his exercise in creature construction it is already with Creature 4 that a structure of ‘anticipated future regret’ is implemented which should help it to stick with its execution of a plan or policy (Bratman 2006b): although future-regret is here merely assisting the creature in resisting temptations to deviate from its plans, it ascribes to it capabilities to envision consequences of planned and deviating actions and its own responses to it.⁴³⁹ Moreover, the anticipation is elsewhere clarified as not merely referring to a counterproductive action but rather being the “anticipation of a breakdown in the cross-temporal coherence of this temporally extended agency” (Bratman 2006b 277). In both cases, however, the consequence drawn because of this anticipated future regret is quite modest: it is taken to support the importance of an agent’s non-reconsideration of his stable plans and policies. It is not taken to force upon the agent active investigation or imagination of whether future situations may give rise to inconsistent actions or to deliberate whether his partial plans and policies might lead to inconsistencies when further specified and filled in.⁴⁴⁰ So although

⁴³⁸ In a later discussion with Frankfurt’s notion of an agent’s identification with his desires, Bratman develops the idea that an agent must be ‘satisfied’ with his intentions and policies, which implies that such a policy “needs to be free from significant challenges from other relevant higher-order policies” (Bratman 2006b 83). In that context he positions his account between a Humean theory of action as being caused by desires and will on the one hand and a Kantian theory determined by universal principles. Both theories, however, do not offer the resources of the problem we’re discussing here: how an empirically plausible theory of action can account for an agent’s actions being consistent at several levels of specificity.

⁴³⁹ The role of future regret in Bratman’s account of planning agency resonates interestingly with Aristotle’s peculiar argument in his *Nicomachean Ethics* (book II.3) that we can partly judge the correspondence of an agent’s character with his action – and consequently its voluntariness – by observing whether he responds with regret or other emotions after the action. Although for some interpreters this argument has been a reason to consider the other, Eudemean ethics as later or superior – (Kenny 1979) – we consider it as an empirically plausible addition to the reflection on voluntary action. Ricoeur, similarly, ascribes importance to an agent’s character which include ‘aspects of evaluative preference’ and connects this notion also with the identity of an agent (Ricoeur 1992 122).

⁴⁴⁰ Somewhat related to this lack is the absence in Bratman’s work reference to the so-called ‘frame problem’ which arose in the context of AI. The frame problem raises the question how much background knowledge must be implicitly or explicitly represented for an agent – artificial or not – to be able to perform a particular task, including knowledge about the stability of properties of objects in the world, etcetera. Dennett refers to Minsky’s work on ‘frames’ and Schank’s work on ‘scripts’ as a way to tackle the problem (Dennett 1987). We have emphasized the importance of such representations for our agent and of their contribution to a stable sculpted space of actions. In our discussion of narrative, we will also note how tradition can be the origin of complex action configurations, which helps an agent to circumvent somewhat the frame problem by assuming their efficacy. Bratman, on the other hand, focuses in most of his work on the framework that an individual agent over time erects as a background for his own action planning. ‘Shared valuing and frameworks’ are treated mainly in the context of a particular joint action or policy, not in order to solve this frame problem (Bratman 2006b). In an 1992 article, Bratman argued that intentions must be context-independent, even if the decision upon which they are originally based are context-dependent. Only when context-independent, intentions can fulfill their organizing and coordinating role over multiple contexts (Bratman 1999b). Contextual knowledge as implied by the frame problem is not at stake here, either, even though it is assumed silently to support this role for intentions to play.

anticipated future regret does signal the agent's imaginative capabilities and even attaches a functional role to it, the exercise of such capabilities of is not included in the account of planning agency as presented to us.⁴⁴¹

There are a few remarks of Bratman's that hint in that direction, although they are concerned merely with weighing alternative actions against each other. Nonetheless, they do refer to an agent's capability and sometime necessity to use his imagination to solve a difficulty in determining his action, as there are no obvious reasons for or against it. For it is acknowledged that with regard to weighing alternatives against each other, sometimes an agent must use his imagination in order to settle the issue and to draw his preference: "[t]he agent will attempt to weigh conflicting reasons by rehearsing in imagination just what would be involved in acting on one or the other of those reasons" (Bratman 1987 59). However, although it seems that reasons are weighed here not in terms of their rationality nor in terms of their calculated utility, it is left undetermined what criteria are used. Instead, weighing occurs in terms of the imagined actions that are associated with those reasons, which may require "procedures of "dramatic rehearsal (in imagination) of various competing possible lines of action"" – as Bratman says while quoting Dewey (Bratman 2006b 150).⁴⁴²

Unfortunately, Bratman does not continue this line of thought nor does he elsewhere articulate what other psychological functions or capabilities are needed to complement his account of planning agency.⁴⁴³ Neither does he consider what Dewey had to say about this dramatic rehearsal. The latter did further articulate dramatic

⁴⁴¹ This absence may have to do with Bratman's conviction that although decisions for action are made against a certain context and therefore context-relative, the resulting intentions are context-independent as they must be "compatible both with the agent's relevant beliefs and with the agent's other intentions" (Bratman 1999a 32). It is precisely their role in the comprehensive web of intentions and beliefs that intentions should be independent in that way. This is different from the narrative approach by Ricoeur, as we will see, which even entails that articulating a narrative will time and again affect even the agent's identity – or selfhood (Ricoeur 1992). As a result, the background against which intentions and promises are made are to some extent always in flux, for example.

⁴⁴² Interestingly, although imagination is nowhere explicitly addressed in Bratman's works as far as we have been able to find, it is referred to twice – both with regard to this same quote from Dewey. It may not be incidental that the quotes differ, though. The 1987 quote runs: "assess the rationality of [agent] S in employing such procedures of "dramatic rehearsal (in imagination)" in his deliberation" (Bratman 1987 59), which suggests that the imagination is here employed in support of rational assessment. A different emphasis is put on the quote in the 2003 article, that has been quote above. In this more complete version, imagination is explicitly devoted to a 'rehearsal' or – as we would say – simulation of possible actions. Based upon such simulations, an agent may come to commit himself to a line of action for which it cannot be definitively reasoned, but which he does also not just want to arrive at through 'unreflective, brute picking' (Bratman 2006b 150).

⁴⁴³ Oddly enough, Bratman comes close to attending to imaginative rehearsal when he considers the role of 'anticipated future regret' that an agent might experience when he imagines himself to give in to a temptation which makes him deviate from his normal policy and thus breach his agential consistency (Bratman 2006b 286-287).

rehearsal of lines of action, as “an experiment in making various combinations of selected elements of habits and impulses, to see what the resultant action would be like if it were entered upon” (Dewey 1922 190). In this rehearsal or simulation – as we will refer to it – , external objects and agents are said to also play their part, all elements together providing the agent some sense of meaning associated with lines of action. Lines of action, we may paraphrase, that essentially contain imagined recombinations of components belonging to his repertory of habitual actions and intentions.

Let us, unlike Bratman, carry this line of Dewey further and consider whether some form of rehearsal – dramatic or not - can contribute to an agent’s sculpted space of action in a way that enhances his coherent self-governing agency.⁴⁴⁴ For example, can an agent experience with such rehearsed recombinations or reconfigurations in a limited experience what realizing a distal intention might amount to, or how certain intentions or policies might clash with each other in a given – perhaps exceptional – situation? More important even, would that rehearsal-dependent experience not only help him to prepare for future actions but also have an immediate impact on his sculpted space of actions? If such imaginative rehearsal or narrative simulation indeed has such an effect then engaging in it may be meaningful for his agency even if it is not immediately recognizable as such. Let us now, in addition to the rational argumentation and deliberation about actions discussed in this section, consider in the next section whether narrative simulation can play a relevant role and if so, how.

4.1.4 Narrative simulation as an additional resource of establishing one’s agency

Especially when distal intentions are concerned, the account of a self-governing planning agent assumes that he is capable of considering an action which might unfold in a future situation. Meanwhile, we have learnt that this is no small feat: for although his sculpted space of actions may help to constrain the space of action options that he will consider and to facilitate the prediction of potential consequences and side-effects of an action, still the coherence and consistency of his actions requires him to additionally consider the ramifications of a future action for some of his other actions and intentions – both past and future ones. Many dimensions are involved in the space of options that open up in that case, even more when the agent should integrate in his distal intention the potential roles of other agents, their intentions and actions.⁴⁴⁵

⁴⁴⁴ As an aside, the word ‘drama’ is derived from the Greek verb ‘draomai’ which means not so much to perform or play, but rather to act or to do. Not surprisingly, Greek tragedians were well aware of the relevance of their dramatic work for their audience and its engagement with actions, as Snell argues (Snell 1928). An obvious source for that observation is Aristotle’s Poetics in which it is argued that author, performer and observer are all participating in the mimetic experience which a tragedy presents.

With these dimensions involved there are also many and diverging values and norms involved, making it quite hard for the agent to rehearse such complexity in his imagination and also hard to conduct an evaluation of the extremely heterogeneous consequences – including future regret. Moreover, since distal intentions are temporally extended they will probably stretch over situations, experiences and consequences that bring highly divergent results which are hard to predict: an early intermediate stage of an action might be exhausting or exhilarating while a later stage might be rather fulfilling, or despairing.⁴⁴⁶ It is therefore important for an agent when engaging in such imaginative action rehearsal not to prematurely abort it – although it is obviously also impossible for him to be complete and comprehensive in such rehearsal.

Such desiderata are not necessarily being met when an agent is forming intentions, plans or policies in a straightforward way. Instead, for these an agent may fall back on a limited exercise in imagined rehearsal that has learnt him how a particular course of action brings about a future that concurs with a particular self-governing policy and its consequences. Indeed, it has again been Aristotle, who has long ago pointed out how such imagined rehearsal may help increase the prudence in agents' decision making with regard to their action. Particularly in his *Poetics*, he points out that by drawing together many different ingredients of an action in a *mythos* or plot, writing or observing a tragedy in fact enables an audience to engage in an experience as if they are acting themselves: “the plot is the imitation of action” (*Poet.* 1450 a 3).⁴⁴⁷ Particularly in more recent times, this idea that the plot of a narrative can be considered as an imitation or representation of action has gained wide currency.⁴⁴⁸ As a consequence, the analysis of narrative has since been included in philosophical discourses about agency and identity.⁴⁴⁹

⁴⁴⁵ The involvement of other agents underscores that coherence and consistency have a limited value for an agent as meta-norms only: various agents may want him to interact consistently with them while complying with the specific values they are each individually attached to.

⁴⁴⁶ Velleman points to the fact that the emotional aspect of narrative explanation is important in that it brings the temporality of actions to the fore. He acknowledges that Aristotle's analysis of poetic *mythos* already includes the 'emotional cadence' it brings about in the audience (Velleman 2003).

⁴⁴⁷ Bywater translates 'mythos' somewhat anachronistically as 'representation', which does not capture the act of imitation ('mimesis') in which author, actor and spectator all participate, cf. (Aristotle 1984 2320). A nice, less traditional yet adequate rendering of mimesis that appears to us to capture Aristotle's intentions is 'enactive imitation', which contributes to the rich understanding and wisdom of the audience (Halliwell 1987 Ch. 4).

⁴⁴⁸ The relatively recent reappropriation of narrative and narrative emplotment as an important phenomenon for philosophical analysis is remarkable as it takes place in both continental and Anglo-Saxon philosophy. The introduction to the Cambridge companion to narrative implicitly offers an explanation for this resurging interest, opposing narrative to science: “Narrative, in other words, is a basic human strategy for coming to terms with time, process, and change – a strategy that contrasts with, but is in no way inferior to, “scientific” modes of explanation that characterize phenomena as instances of general covering laws” (Herman 2007 3). Dissatisfaction with science, it seems, could lurk behind the interest in narrative.

Indeed, in the present context, narrative is taken similar to intentions, namely as a representation in which actions are put central – actions in a plural sense, since narratives are generally not restricted to a single (agent’s) action.⁴⁵⁰ Yet more than when forming a particular intention, an agent who is forming a narrative’s plot is establishing the ‘synthesis of heterogeneous elements’: “by means of the plot, goals, causes, and chance are brought together within the temporal unity of a whole and complete action” (Ricoeur 1984 ix).⁴⁵¹ This synthesis consists first of elements that intentions share – though in a much more limited sense – with narrative, namely ‘events or incidents’ that are taken together in the narrative. Second, narrative integrates also elements that do not figure in intentions – or only in a limitative sense: it contains not just the intended, planned and anticipated elements of actions or events but also those that were not intended, planned, anticipated. Finally, given these heterogeneous elements, the synthesis established by a narrative is brought about by providing a configuration of these elements instead of a mere succession. This configuration is temporal in nature and this temporality of narrative is essential for the synthesis or unity that narrative can establish (Ricoeur 1991a).⁴⁵² Taken all together, these ingredients and their configuration yield narrative’s meaningfulness.

With this synthesis of heterogeneous elements narrative is providing the resources that are required for the dramatic rehearsal in imagination of alternative action intentions.⁴⁵³ Given their distal nature, such rehearsal is important when an agent is

⁴⁴⁹ An early review of the interaction between the philosophy of action and the theory of narrative is given in (Van Dijk 1976), focusing particularly on the discourse structure of narrative and how action components are represented. Ricoeur defends systematically the general comparability of action and text in his (Ricoeur 1971), which we have brought together with Gadamer’s position in (Keestra 2008).

⁴⁵⁰ In her introduction to an edited volume on ‘Practical identity and narrative agency’ the author writes: “The central claim of narrative approaches to identity or agency is that the lives of persons cannot be thought of as a series of discrete, disconnected experiences or events. Rather, to be a person is to exercise narrative capacities for self-interpretation that unify our lives over time” (Mackenzie 2008 11). The narrative approach to agency as applied by us is meant as an extension of the planning approach to agency that we’ve analyzed above. Self-interpretation is here taken to include a reflexive ‘imagined rehearsal’ and interpretation of one’s agency, which is required for a temporally extended and planning agent.

⁴⁵¹ In his conversations with Changeux, Ricoeur has insisted on a distinction between phenomenology and the cognitive sciences, asking “can intentions in fact be naturalized?” (Changeux and Ricoeur 2000 67). Later on he elaborates on the complexity and dynamics that intentionality entails, including a form of selfreflection. Neuroscientist Changeux suggests to study these questions by way of discussing “plausible models of selfregulation; to discuss testing the internal consistency of plans of action” (Changeux and Ricoeur 2000 69). Ricoeur then expresses “wonder about our understanding” of the relation between such models and our actual experience, yet does not deny their possibility in a principled manner. Our account here is aimed to contribute such a ‘plausible model of selfregulation’ in which intentionality and neural processes are integrated. We do so, i.a. by providing a neural simulation account of the role of narrative in agency.

⁴⁵² Indeed, a crucial aspect of narrative is how it allows ‘games with time’, in Ricoeur’s words: it can put mere succession into an intentional order or reconfigure events, it can foreground some actions and push others in the background, it can change the tempo of events, etcetera (Ricoeur 1985).

forming distal intentions as he should try to establish a comprehensive representation of an action's effects and ramifications. Although this may appear as an impossible task, it is again in this context of narrative that a hierarchical structure can be distinguished which eases it. However, in comparison to our previous discussions, this narrative configuration of actions is only partly overlapping with the intentional cascade which we've established so far.

The narrative configuration of actions does extend this hierarchy of intentions as it invites the agent to reflect upon his agency at higher hierarchical levels than discussed above. For the hierarchical levels that Ricoeur distinguishes are the level of 'practices,' the level of 'life plans' and the level of the 'narrative unity of life' (Ricoeur 1992 153-163). Particular the latter is requiring a type of synthesis of heterogeneous elements that is not included in the account that did range from motor intentions via proximal to distal intentions. The consistency and coherence that the intentional cascade has been shown to support does require the agent to consider his intentions both temporally and contextually broader than we described so far. Let us consider the less wider levels before elaborating the widest narrative level, the level of the unity of an agent's life.

Were distal intentions so far limited to plans or policies, 'practice' in Ricoeur's sense refers to a broader unit of action as it includes reference to a rule governed, general set of plans and policies that belong to a certain practice, like the practice of music making or teaching. Although simple actions are comprised in such a practice, practice itself is a 'global action' consisting of a 'nesting relation' between many subordinated actions (Ricoeur 1992 153-154). Important to note is that, apart from its greater complexity, a practice is constituted by intersubjective rules that have become internalized – often through interactions – by an individual agent, although an agent might be deviating from or neglecting such a rule.⁴⁵⁴

Taking these characteristics into account, we can expect tradition to play an important coordinating and organizing role in such practices. In fact, an action is always navigating between tradition and innovation: tradition provides constitutive rules and norms for a practice which are inevitably always caught up in change

⁴⁵³ The imagined actions contained in narrative are still 'imitations' of an action in this account, and thus still "subjected to the constraint of the corporeal and terrestrial condition" (Ricoeur 1992 150) – they can be integrated in an agent's sculpted space of actions and are not mere unbounded phantasies.

⁴⁵⁴ In his psychological account of narrative as a form of mental organization used by all humans, Bruner counts among the properties of narrative its particularity, composability, diachronicity, canonicity and breach, and its normativeness. Canonicity and normativeness are related in that these also contribute to narrative's understandability, even if a narrator can allow himself to deviate somewhat from such norms (Bruner 1991). Comparable is the 'narrative practice hypothesis' which aims to offer an explanation for the development of children's capabilities to make sense of other people's actions by understanding and mastering the narratives that accompany and elucidate these actions (Hutto 2007 ; Gallagher and Hutto 2008).

and modification.⁴⁵⁵ Such a practice is generally rather implicit, which renders it a ‘prenarrative quality’ or a ‘narrative prefiguration’ (Ricoeur 1992). In other words, the representation involved in a narrative account of a practice articulates an implicit and complex hierarchy of component actions and it the result of both a sedimented tradition and a parallel history of inevitable innovations (Ricoeur 1991c).

The second hierarchical level in this account of action is even more comprehensive than a practice is, consisting even more of a configuration of heterogeneous components. The ‘vast practical unit’ that is at stake at this level is the ‘life plan’, which consists of distal intentions with which an agent shapes his ‘professional life, family life, leisure time, and so forth.’ Here we find more explicitly an important role for the kind of imagined rehearsal of different lines of actions, in which action plans are included as mere components, for it includes: “the weighing of advantages and disadvantages of the choice of a particular life plan on the level of practices”(Ricoeur 1992 158). What is emphasized in this context is that such life plans are not only determined by the relatively stable and predictable practices which shape an agent’s actions, but also by the much less stable, predictable and representable ‘unity of a life’ – the third level in this account.⁴⁵⁶

Are practices and life plans already rather difficult to determine, requiring an agent to develop representations that are complex, dynamic and consisting of heterogeneous component actions, isn’t it impossible to configure a ‘narrative unity of a life’? Given alone the involvement of many situational and intersubjective factors, isn’t the unpredictability of future trajectories of him and his actions such that it makes such an effort meaningless? Nonetheless, given the expected modulating effects of developing such high level representations on the lower hierarchical levels of an agent’s intentional cascade, narrative probably still contributes to the development of an adequate sculpted space of actions. That is, by engaging with a narrative account, the agent is required to develop configurations that are more or less successful in accounting for his past actions and influencing his potential future actions, irrespective of his principal finitude and the corresponding fragility of these distal intentions and actions.⁴⁵⁷ In sum, we expect

⁴⁵⁵ This inevitability of modification and change is connected to the ontological fact that an action has always an autonomy and objectivity comparable to those of a text, which is inevitably interpreted independently from the author’s subjective intention (Ricoeur 1971).

⁴⁵⁶ Similar to Bratman’s methodological priority of future-directed intentions (Bratman 1987), in Ricoeur’s account we find a primordial role for the configuration of the unity of an agent’s life. Coherence relies to a large extent on the unity over longer periods of time in both accounts.

⁴⁵⁷ Discussing historical narratives, Ricoeur elsewhere considers how (re-)configurations of the past are intimately related to configurations of future actions and events, and conversely, or “the complex interplay of significations that takes place between our expectations directed toward the future and our interpretations oriented toward the past” (Ricoeur 1988 208). It is also emphasized how narratives – also private ones – are never closed for “we can see how the story of a life comes to be constituted through a series of rectifications applied to previous narratives” (Ricoeur 1988 247).

precisely by his articulating – or rather: attempting to repeatedly articulate modified versions – a comprehensive account of his actions at several levels of specificity that he can aim to consistently sculpt his space of actions. If not for its correctness, it is such a contribution that supports the demand for a “narrative unity of a life, under the sign of narratives that teach us how to articulate narratively retrospection and prospection” (Ricoeur 1992 163).

Important to note is that building such a narrative is not a task that an agent only needs to do once and for all, or that after having at a certain moment presented a ‘narrative unity’ of his life he only needs to add novel events and actions to it. On the contrary, an agent will need to revisit his narrative self-account as he will discover that a particular configuration of events, intentions and actions has turned out to be relevant for his life, even though it wasn’t part of his narrative before. In narrating and renarrating his life’s events and actions, he continues to reconfigure the intentional, temporal and normative elements that constitute his identity – which he may do with some freedom, although coherence and consistency between his narratives should be guarded, as well.⁴⁵⁸

As such, engaging with narrative, even if it should recount something as overwhelming as his ‘unity of life’ is at the same time a way for the agent to get to know and to interpret himself and in so doing results in a ‘refiguration of the everyday concrete self’ (Ricoeur 1991d). The term *mimesis*, which plays an important role in the account of narrative’s contribution to the agent’s identity, captures this double role of both representation or imitation of his life and of its arrangement with the help of the imagination (Ricoeur 1991c). Narrative, we can conclude, is not an addition to an agent’s agency or intentional cascade without any impact on these but should instead be considered an integral component of it.⁴⁵⁹ Indeed, narrative offers contributions to the sculpted space of actions in addition to those that we have considered earlier. We will characterize those in the next section.

⁴⁵⁸ Narrative, according to Ricoeur, can be considered as a ‘second-order discourse’, referring not directly to the events and actions of an agent’s life. Although it does to some extent represent events and actions, its second-order nature allows some liberty in their configurations, upon which the agent’s identity also builds (Gregor 2005).

⁴⁵⁹ Although the role of narrative in a subject’s life is often taken to support self-understanding and reflection, in the current context its role is understood as supporting the consistency of his actions. These two roles can enhance each other, as is suggested by Schechtman in writing: “The basic features of the hermeneutical view are most easily explicated by looking at the strong connections it draws between selfhood, narrative, and agency. Selves are fundamentally agents on this view, and agency requires narrative” (Schechtman 2011 3). However, with regard to the critique of the assumption that a subject’s selfhood would require it to employ narrative (Strawson 2004), it is relevant to emphasize how here our primary interest is in narrative’s role of supporting agency. Indeed, we concur that it is advisable not ‘to expect too much’ from narrative particularly with regard to the construction of personal identity (Lamarque 2004).

4.1.5 Narrative as simulation of distal intention, contributing to a sculpted space of actions

The coherent yet fast and flexible performance of our expert singer is supported by the establishment of a cascade of representations of actions based upon his previous experiences. Be they in the form of motor intentions that yield prepotentiated motor responses to particular affordances that a given stage scene present to him, or the distal intention to avoid smokey environments during a performance period, they sculpt his space of actions at several levels of specificity. Nonetheless, his experiences are necessarily limited and may not be adequate in preparing him to act appropriately in all future situations – not only for those future events that are unpredicted but also for those future situations that he anticipates or expects to happen. Given the complexity of each situation, offering multiple lines of action, it is a challenge for our singer to imagine what courses of action would in a future situation be open for him and how these would unroll, both in light of his past actions as in light of their potential consequences. What resources does engagement with narrative provide to him in these respects, how does “narration serve as a natural transition between description and prescription” (Ricoeur 1992 170)?

To begin with, when narrating an action, an agent is not just recounting all he can remember concerning it. Instead, it is a simulation of an agent and his experiences embedded in a context, a simulation which is always dependent upon some form of selection and abstraction as only a limited amount of - relevant - elements are represented in it. Another important aspect of narrative is, as mentioned above, that it configures events, actions and other relevant elements in such a way that a meaningful synthesis in terms of actions is created instead of a mere succession of events (Ricoeur 1988). One may wonder what use such a simulation can have for deciding about future action options, if it is so much dependent upon processes like the abstraction, selection and configuration of elements. What can such simulation bear upon the agent’s every formation of action intentions?

However, precisely because narrative simulation does require an agent to constrain and synthesize the elements that go into a narrative about himself and his actions, it offers him resources for ‘explanation by emplotment’ (Ricoeur 1984 181). Important with regard to this process of giving a narrative account of his actions is the fact that in doing so his identity is always both challenged and reaffirmed. Is the mere development of such a simulation in itself already a sign of the agent’s capability of both distantiation from and reappropriation of himself, the narrative does enforce upon him a certain identification with his actions. This identification has two aspects.

First, we assume the identity of an agent who is the subject of a narrative to have

a certain constancy, to remain the same. Without him remaining the same, any form of coordination and organization of actions, or care for means-end coherence and avoidance of counterproductive actions would be impossible. However, this refers only to a limited form of identity which is that of 'sameness'. Sameness refers primarily to the agent's corporeal constancy: "bodies are indeed eminently identifiable and reidentifiable as being the same" (Ricoeur 1992 33). Sameness, applied to an agent who is the subject of a narrative account of his actions, does emphasize his permanence in time which is a precondition for the other aspect of identity, about which we come to speak in a moment. Before doing that, it is relevant to note that this self-constancy is fundamental not just for the individual agent but also for his interactions with others over time and the coordination and organization these require. This is the case even though narrative can challenge an agent by presenting him alternative configurations or action options, tempting him to deny his sameness. Although he might be used to making promises of future actions, he might well also ask the promisee: "Who am I, so inconstant, that *notwithstanding* you count on me?" (Ricoeur 1992 168, italics in original).⁴⁶⁰ This brings us to the second aspect of identification, which refers to the agent's self-hood rather than sameness.

Notwithstanding the corporeal constancy, which supports the sameness of an agent over time, agents are also notoriously inconstant. Ricoeur uses the example of a promise which an agent can make, allowing him to create a relation between past and future actions which is at the same time, however, vulnerable to the agent breaking his promise and this relation. Sameness and selfhood are put in what Ricoeur refers to as a dialectical relation, in which selfhood presupposes sameness while at the same time extending this agential constancy with a capacity for diversity and deviation. Even though the agent's longstanding attitudes and policies - those which represent in Aristotelian terms his character⁴⁶¹ - constitute his constancy and sameness,

⁴⁶⁰ Ricoeur offers a critique of the Lockean account of identity by arguing that we need to apply a more dynamical notion of identity - as is presented by his narrative account of identity - than Locke has presented (cf. (Ricoeur 1992 143)). Bratman in turn does provide an analysis of agential identity in terms of 'Lockean continuities and connections', which Locke had originally grounded in the agent's memory and Bratman bases upon the self-governing policies that an agent has adopted (Bratman 2006b 29, 42, 59, 82, 270). The specific challenges to that identity that the narrative account provides notes are indeed absent from such a Lockean account, leaving agential identity less dynamic.

⁴⁶¹ Ricoeur refers to character as 'the set of acquired dispositions and sedimented identifications-with' (Ricoeur 1992 167). Character as an essential ingredient for moral agency has been introduced by Aristotle, who has coined the notion of 'hêtos' in his ethics. With its long-term dispositions and attitudes, it is the source of constancy in an agent's actions and of his emotional responses afterwards. It has evolved over time, partly due to the voluntary choices that the agent has made (*Ethica Nicomacheia* III, 5). Nonetheless, Aristotle acknowledges that there are also constraints at work, some of which of natural and others of social nature (cf. (Leunissen 2012)). Sherman has pointed out how we can distinguish 'character coherence' and 'temporal coherence' in Aristotle's ethics, of which the former not just refers to rational coordination and organization of actions but rather to the moral unity of a life (Sherman 1989). This is quite similar to the two forms of identity that Ricoeur refers to (Ricoeur 1992).

by employing our narrative imagination we can envision how this selfhood is shown not to be equal under all conditions, indeed: “This mediating function performed by the narrative identity of the character between the poles of sameness and selfhood is attested to primarily by the imaginative variations to which the narrative submits this identity” (Ricoeur 1992 148).

According to this account of narrative identity, an agent cannot choose to avoid such variations with respect to his identity if he develops such a narrative about himself.⁴⁶² Did we note above that Bratman did leave an extra role for the “dramatic rehearsal (in imagination) of various competing possible lines of action” (Bratman 2006b 150), narrative identity is for Ricoeur not an extra option on top of sameness or selfhood that an agent can choose to engage with, or not. The narrative unity of life, resulting from his attempt at configuring a narrative emplotment of many heterogeneous elements that is never complete and homogeneous, contributes essentially to the agent’s identity and functioning as an intentional agent.⁴⁶³ By developing a narrative unity of his life, with its many past and future actions and interactions and their diverse ingredients, the agent will always be affected by this form of self-understanding as it results inevitably in a “reconfiguration of life by narrative” (Ricoeur 1991a 26). According to this account, narrative is more than just another tool for developing and evaluating distal intentions: when he is engaging in narrative in order to simulate his distal intentions in a comprehensive sense, he is at the same time reconfiguring his identity in a way that is not included in Bratman’s account of distal intentions and policies.

Moreover, this reconfiguration of the agent’s identity takes place in the wake of a narrative process that employs configurational schemas which are not completely developed *de novo* by him.⁴⁶⁴ On the contrary, as was already noted in the previous

⁴⁶² Not all agents will have an equal interest in developing such self-narratives nor do they all experience a similar need to do so. Galen Strawson even suggests that narrative is more an ‘affliction’ than a ‘prerequisite’ for a good life (Strawson 2004). Agreeing with that remark only to a small extent, we would rather suggest that perhaps those lives that are lived rather according to traditional schemas and in stable intersubjective relations require less engagement with narrative than those lives of which the complexity and dynamics increase the risk of a lack of coordination and organization between actions.

⁴⁶³ Carr also points out that as much as narratives are based upon selection and selective attention, so are subjects also trying to govern their lives by selectively attending to and planning for some over other elements and actions – even if they will never completely succeed in avoiding unselected events etc. (Carr 1991).

⁴⁶⁴ An agent will continually engage in such narrative recounting of his life – with its ‘elusive character’ – and actions as a way to “organize life retrospectively” for which the intersubjectively and historically developed schemas are employed, as he is: “prepared to take as provisional and open to revision any figure of emplotment borrowed from fiction or from history” (Ricoeur 1992 162). Given the fact that his life is always engaged in intersubjective interactions it is plausible that such traditional schemas or configurations will fit coherently to his life as an agent. Obviously, the ‘models’ that are handed down by tradition are not withstanding innovation as they can be taken to “provide a guide for later experimentation in the narrative domain” (Ricoeur 1991a 25), as in the domain of action according to our account.

section, the schemas are handed over by tradition. As a result, when the agent is implicitly reconfiguring his identity by developing a narrative account, he is simultaneously both sedimenting and innovating a traditional schema upon which any such narrative about an agent and his actions is based.⁴⁶⁵ The same dialectic between constancy and inconstancy that we have observed with regard to the agent's identity therefore applies to the schemas that he always uses for the articulation and explanation of it.

To resume these last sections: we have observed how an optimal coordination and organization of his actions seems to force upon the agent a process of simulation of ever higher levels of distal intentions and even a narrative self-account. Doing so is inevitably a challenge to his identity in that such a narrative self-account also results in some reconfiguration of it, as much as it also affects the traditional schema that is involved in such an account.⁴⁶⁶ Relying on his sculpting the space of his actions when planning distal actions, therefore, the agent both employs and reconfirms its pre-existing characteristics while modifying these at the same time. As speculative as this may sound, it is intriguing to find that empirical evidence regarding the prevalence of simulative processes in humans does largely support this process description, based here primarily upon philosophical analysis.

4.2 Distal intentions and narratives and their reciprocal interactions with cognitive mechanisms

Our investigations so far have demonstrated how our expert singer can rely upon the establishment of a sculpted space of actions when he is rehearsing and performing one of his operatic roles. Different types of kludges will develop during the many hours of practicing, rehearsing, and reflecting upon these roles and play a major role in his expertise, like when he must prepare a new performance.

When preparing a new performance of Don Giovanni under a new director and with a new set, our expert singer can mentally rehearse his part by developing simulations of it while employing his memories and experiences so far and including his established intentions, preferences and choices. Checking for coherence in his

⁴⁶⁵ There is a mutual dependency of actions and employment: human actions are in a crucial sense mediated by narrative plots and narrative is – as Aristotle already observed – essentially about actions. Ricoeur writes about the human action that if it “can be recounted and poeticized, in other words, it is due to the fact that it is always articulated by signs, rules, and norms” (Ricoeur 1991c 141). In the previous section, section III.4.1.4 we've referred to the different levels of action – practices, life plans, unity of life – that are also determined by a socio-cultural context. Ricoeur even contends that “[t]raditions are essentially narratives” (Ricoeur 1988 260)

⁴⁶⁶ As Scott-Baumann argues, Ricoeur systematically navigates between what is called the “totalizing tendency of a metanarrative like Hegel's” and the “total rejection of such narratives by Lyotard”, which applies also to the narrative identity of an agent (Scott-Baumann 2009 92).

actions and singing, he will develop a representation that is hierarchically structured, organized with acts, scenes and concrete actions, which are also temporally organized. This relatively effortless simulation may come abruptly to a halt when he reads in the stage directions that he is to violently attack Zerlina and walk around half-naked. These directions disturb his simulation when he realizes that they conflict with some of his other intentions or long-standing attitudes that he has developed and probably also publicly expressed. Instead of simply continuing the simulation of his performance, he is now forced to consider and articulate whether compliance with these directions would undermine his personal or artistic integrity, for example. Doing so requires him to find out what eventually happens to both the Don and the maiden during the play – whether some poetic justice is being done, or not – , if the piece is broadcast or otherwise can be seen by young children, whether his physical appearance forbids its nakedness, whether him doing this performance would contradict previous interview statements of his, and so on. Obviously, this is no longer a matter of further elaborating a particular action representation, as it requires him to analyse many of his intentions and multiple previously performed actions, to consider his preferences and norms, to simulate potential interpretations of his performance by an audience and then to check for coherence and conflicts between these ingredients.

It is in such a case that narrative simulation will play a crucial role and spell out the necessary web of intentions, draw upon relevant past histories and look forward to potential future actions and events. Such a narrative simulation is a rather comprehensive and time-consuming task that is never really completed. Given our interest in kludge formation as a result of learning and development and in the role of kludges in facilitating an expert in making fast and flexible responses, we are now facing the question whether the processes and representations involved in such narrative simulation can undergo a similar process of kludge formation, or not? Before answering that question, remember that we've highlighted three – of the original seven – kludge characteristics in the present Part. First, we noticed that kludge formation is observable in the performance properties of a particular function, as performance usually becomes more coherent and consistent. Nonetheless, the kludge's implementation in terms of represented information or of neural correlates cannot be derived from these properties. Second, a kludge is established usually by the re-use or recruitment of already available component mechanisms and it can itself subsequently be employed as a component in a functional mechanism. Indeed, when a kludge is further employed it becomes ever more generatively entrenched in the dynamical system or organism. Finally we noted that environmental and even cultural information can become integrated in a kludge's performance – like conceptual

information or a ritual object that automatically modulates expert action.

These kludge characteristics were found in chapter III.2.2 to apply to the development of sensori-motor representations in the form of templates with free slots underlying an agent's motor intentions, enabling experts to perform habitual actions both more efficient and more flexibly than novices (Gobet and Simon 1996). Well established proximal intentions, we later found in chapter III.3 ff., involve more elaborate hierarchical representations – like Structured Event Complexes (Grafman 2003) – that are employed and modulated by several cognitive processes, like the automatic contention scheduling process and supervisory attention (Cooper 2002). Supervisory attention or other processes can also modify or even generate new representations that might eventually be integrated in newly established kludges.

Indeed, in II.4 we've discussed how a particular 'simulator' can be considered to be an example of the kludges that our brain appears to be capable of establishing. For our discussion of simulation we did rely upon Barsalou's theory of perceptual symbol systems (Barsalou 1999c) and later elaborations of that simulation account. In that context, we noted two features that are relevant to recall here. This simulation account argued that sensori-motor representations are not stored as a whole, but that features of those representations are stored in a highly distributed manner across the brain. This process of coding, storing and reconsolidating memory features can in turn be modulated by other processes, like by the attention an agent pays to one or more of those features (Barsalou 1999c ; Barsalou 2009). Second, agents can activate or reactivate through multiple cognitive processes a complex of many different features that are more or less associated with each other and in so doing simulate past, future or imaginative experiences: "simulation is the re-enactment of perceptual, motor and introspective states acquired during experience with the world, body and mind" (Barsalou 2009 1281; cf. Barsalou 2008).

In these last sections of our final Part, we will consider how the development and consideration of distal intentions relies upon such simulation processes. Such simulation processes should then underly not just the articulation of a complex and temporally extended action intention, but also the imaginative rehearsal or narrative of a multiplicity of such intentions and integrating contents from the agent's past and visions of the future, too. In this way, simulation should facilitate an agent to anchor and specify his intentions not just in a particular situation *hic et nunc* but also in intersubjective situations in a more distant future. Of particular interest to us is whether and how such simulation contributes to the agent's overall sculpted space of actions and is eventually observable in his actions, as well. This brings us back to the issue of kludge formation, even if by now we may expect that when this is happening

with respect to narrative simulation, too, its implementation to be more complex as well.

Indeed, in these last sections we will present some relevant evidence confirming the assumption that kludge formation also applies to this level of distal intentions and narrative simulation, contributing again to the coherence and flexibility of an agent's actions. It may as well not be surprising to find that the kludge finally appearing at this level is a rather complex neural network. Indeed, this so-called 'default mode network' has been discovered only recently (Raichle, MacLeod et al. 2001) and has been meanwhile found to be directly or indirectly involved in many different cognitive processes, which explains why it is still a matter of debate what its components and properties are, and what not. Notwithstanding such differences, there is agreement that its "intrinsic activity instantiates the maintenance of information for interpreting, responding to and even predicting environmental demands" (Raichle and Snyder 2007 1087). In doing so, this default mode network (DMN) constitutes for the agent a kludge that is relatively stable and enables his acting coherently and flexibly without always demanding explicit reflection. Concurrent with our reasoning, the DMN is determined both by the lower levels of the intentional cascade as by the level of distal intentions, like when it is modulated by the agent's explicit narrative simulation.

Let us take a look at some empirical evidence for the contribution of our simulation capabilities to our performances as a planning agent, by first paying attention to the simulation of a single distal intention and then the narrative simulation of a more complex web of intentions.

4.2.1 From memorized experiences to the simulation of future actions

As mentioned above, experiences help an agent to learn performing certain motor skills or more complex behaviors in a flexible way. The sensori-motor representations or more complex Structured Event Complexes that are the result of expertise and learning enable an expert to perform differently in comparison to novices. These insights offer a picture of memory or stored information different from traditional accounts of memory, which generally contended that memory was meant to keep an archive of the past.⁴⁶⁷ In contrast to this, more recent accounts emphasize the role of

⁴⁶⁷ Indeed, as early as 1932 Bartlett argued that the function of memory should not be considered to archive and reproduce a faithful picture of the past (Bartlett 1995 [1932]). Research has confirmed that there are many specific vulnerabilities or modulating factors involved in the three phases of memory, i.e. the encoding, consolidation and retrieval phase (Straube 2012). Instead of faithfully reproducing the past, evidence shows the reliability of memories to correlate with the likelihood that they are needed for future tasks, implying that "the memory system tries to make available those memories that are most likely to be useful" (Anderson and Schooler 1991 400).

memorized information to enable future action.⁴⁶⁸ Indeed, it is argued that memory must have an adaptive value and therefore help an organism to better prepare for future actions (Klein, Cosmides et al. 2002). Arguments to that effect have not only relied upon insights about biological evolution. More generally – which is discussed particularly in Part II - complex and dynamical systems must be capable of letting environmental information determine partly its development in order to enhance the speed and flexibility of its interaction with its environment (Simon 1973). A very simple example to which we referred earlier is the relatively rigid mechanism of imprinting in goose chicks, which has been shown to be sensitive to contingencies of the environment, determining the drastically different trajectories of those chicks' lives that were imprinted by a human instead of an avian being (Wimsatt 1986). Such animals are not capable of explicating what information it is that they have stored or how they employ and affect their behavior accordingly, but these limitations do not stand in the way of some form of adaptivity via acquired traits that are based upon represented information.⁴⁶⁹

Also on the neural implementation level, there have associations been found between the processes involved in memory and in the simulation of future actions. At a more fundamental level, both long term potentiation and the principles of Hebbian learning apply generally to those processes and indeed can explain why experience based learning is associated with specific dispositions that determine future cognitive and behavioral responses (Kandel 2009). At a more complex level, similarities in the neural networks between memory and preparation for the future have been found as well. After decades of research, different taxonomies of memory haven been proposed that correspond not only with different neural networks but also with properties regarding the simulation of future actions (Nadel 1992 ; Sherry and Schacter 1987).

⁴⁶⁸ Obviously, this is only one observation underlining the theory that most, if not all, cognitive functions have evolved such that they are preparing the organism for future actions. Several theories have been presented, which reinterpret the evidence about cognitive functions and brain processes along those lines, like the theory of predictive coding (Friston 2005 ; Clark 2012), the theory of the proactive brain (Bar 2009 ; Pezzulo and Ognibene 2012), or theories assuming the prevalence of Bayesian processing in the brain (Barsalou 2011 ; Colombo and Seriès 2012 ; Kording and Wolpert 2004). There is some overlap between these theories, as Bayesian processing allows the brain to operate as a "prediction machine" (Clark 2012).

⁴⁶⁹ The notions of information, representation, and cognition implied by this example are all debatable – see e.g. (Bechtel 2008 ; Dretske 2003 ; Gärdenfors 2004a ; Keijzer 2002 ; Piccinini and Scarantino 2010 ; Rowlands 2012). Engaging with that debate falls beyond the scope of this book. However, we consider the fact that under certain conditions the goose chicks are responsive to a set of features, related to each other in a particular configuration, to be a matter of their being responsive to a representation of natural – non-conventional - information. The perception and cognitive processing of these features and their configuration allow for several mishaps, leading to dysfunctional responses, as when a chick would start to escape instead of approach the animal which appears to be its parent.

Indeed, the ‘neural machinery’ that is recruited for remembering the past turned out to be largely overlapping with the machinery involved in the simulation of the future (Schacter, Addis et al. 2007). An interesting example of such a correspondence has been observed when an agent aims to influence his future action with counterfactual thought, as when he simulates how a particular action might have been different with regard to action properties or outcomes. Overlapping neural network activations have been interpreted as involved in representing the Structured Event Complex pertaining to the specific action (Barbey, Krueger et al. 2009).⁴⁷⁰ In sum, simulation of one’s future action is effective, it can be said, by developing or modifying an action representation that is then stored as a memory and offers a preparation for its future implementation in motor behavior – thus underscoring the interdependence of memory and simulation of the future (Papies, Aarts et al. 2009).

Such insights about the general association of a complex and dynamic system’s capability to store representations and its preparation for the future did not preclude other perspectives on intentional action planning. Indeed, it was initially thought that intentional action planning in humans depends upon specific capacities that were held to be exclusively human – in particular human language and episodic memory, which both are responsible for specific representational functions. Meanwhile, various lines of evidence showed otherwise and forced the nuancing of this assumption. For example, evidence from amnesic patients and other subjects have shown that planning for personal future actions can survive in the absence of episodic memory, demonstrating that relevant information can also be represented in semantic memory and still be involved in simulation processes and be adequate for some forms of planning (Klein 2013). Similarly, evidence in animals like scrub-jays and primates has suggested that even they are capable of some form of ‘foresight’, of planning future actions (Suddendorf and Corballis 2007).⁴⁷¹ So notwithstanding apparent differences between animals and humans with regard to the possession of language, to metacognitive abilities and to the available types of memory, they do appear to share some capabilities for action

⁴⁷⁰ There are psychological differences between remembering the past and such simulations, to be sure. The clarity and vividness of remembering the past to be stronger and emotional intensity does not appear to be equal for all conditions (De Brigard and Giovanello 2012).

⁴⁷¹ A remarkable observation was that of a male chimpanzee in a zoo that collected during quiet mornings ammunition as it had the ‘foresight’ that he would need this when in the afternoon he would be irritated by human spectators shouting and grimacing at him. Remarkable was that the observed motivational state of the chimp during collecting was different from the state he later would be in when using the stones, whereas most planning in primates is dependent upon the similarity of their motivational states at both the planning and execution phase of an action (Osvath 2009). This observation notwithstanding, it is widely held that such future-directed planning on behalf of anticipated, future motivational states is not available to primates (cf. Bischof (Bischof-Köhler 1985 ; Pacherie and Haggard 2010).

planning involving the representation of such action.⁴⁷²

Observations in children and in novices confirm that previous experiences at first only implicitly contribute to their improving performances, with explicitation being left to later stages. For example, in the beginning of their motor skill learning, they are incapable of articulating the relevant representations involved or of consciously governing their use in future actions.⁴⁷³ However, according to the neuroconstructive account of skill learning - which has been discussed in chapter II.2 ff., - the proceduralization of a skill is followed by its explicitation: after automatizing the skill, its explicitation eventually allows a skilled child or expert to make connections between different representations associated with the skill, to draw analogies, and so on (Karmiloff-Smith 1992). This productive use of representations is enabled by the process of Representational Redescription which obtains during learning, it being associated with the cognitive and behavioral differences between novices and experts (Clark and Karmiloff-Smith 1993 ; Cleeremans 1997 ; Karmiloff-Smith 1990 ; Mareschal, Johnson et al. 2007).

These observations are perhaps not surprising in that they just demonstrate how stored information allows an agent to better prepare for future actions. Moreover, they concur with the observed parsimony with which brain mechanisms develop and perform their functions, generally by re-using or recycling previously established components and by forming kludges as a result of developing and learning, as was discussed in our previous Parts. However, it is relevant to note that action representations can have such preparatory value even if past and future actions are not identical. In between their involvement in past and future actions, such stored information can apparently be modified flexibly, yielding useful representations under changing conditions. The question that then presents itself is how are stored action representations used in the simulation of future actions, like when an agent is engaged in forming distal intentions or in narrative? Can we observe a form of kludge formation in this context, too? Moreover, we would like to know whether these simulations are also affecting the sculpted space of the agent's actions and whether this is observable in his behavior. These questions will concern us in the next sections.

⁴⁷² Developing a rodent model of episodic memory, Crystal reviews evidence in rats of their capability of not only remembering specific events in the past but also of employing these representations with some flexibility (Crystal 2013).

⁴⁷³ Computational and observational studies show, however, that skill learning can be facilitated by the use of both implicit and explicit learning. Explicit learning initially depends upon the articulation of representations of relevant information and tasks. Yet, the two types of learning can at times also conflict to the detriment of skill learning (Sun, Slusarz et al. 2005)

4.2.2 Distal intentions in the intentional cascade: from action control to mental time travel

Let us first return to the intentional cascade, which has provided the structure of our discussions so far, even if we have observed some limitations of the distal intentions as presented there. When discussing the functional role of intentions in her account, Pacherie focuses on the different forms of control that are associated with motor, proximal and distal intentions respectively. Control is implemented in the intentional cascade in the form of comparators, comparing the properties of representations of a desired state of affairs, of the action that is supposed to realize that state and of the eventual outcome of that action (Pacherie 2008). The idea lying behind this model is that multiple representations of an action are being processed simultaneously, representations that can also partly be shared by different cognitive processes. It has been Jeannerod who has worked on the theory of shared representations.

The theory of shared representations was presented in order to account for various phenomena, ranging from significant overlap in neural activation patterns during the observation and performance of similar actions to the delusions of action control that occur in schizophrenic patients (Georgieff and Jeannerod 1998). These findings were added to other experimental results that together lead researchers to conclude that even though action representations are processed during different functions – like when actions are being observed, imagined, verbalized and performed (Grèzes and Decety 2001) – the neural implementation of these representations overlap to a large extent. Indeed, as Jeannerod did conclude, the greatest difference between all those forms of ‘simulation’ – in his words - and the performance of a real action may just be the lack of motor activation in order to physically execute the action representation in the former (Jeannerod 2001).⁴⁷⁴

Instead of elaborating upon this notion of simulation, Pacherie has chosen to integrate into her intentional cascade several comparators, each of which are focusing on similarities and differences between representations of a state or action. Neuroscientific and computational studies have indeed suggested that representations are employed in parallel in preparation of and during an action and that the – implicit - comparison of such representations support the continuous monitoring and adjustment of an action (Wolpert, Ghahramani et al. 1995). In the intentional cascade model, three comparators are assumed to be part of that model. One comparator is held to compare the actual feedback that the agent receives with the initial desired state he had when

⁴⁷⁴ This explains why exercising motor movements through imagery is effective in ameliorating their real performance, as is for example demonstrated in motor imagery exercises in rehabilitating stroke patients (de Vries and Mulder 2007).

developing his intention. Another one allegedly compares his motor command with the actual outcomes of the motor action and is connected to his proximal intention. A third comparator is not relying upon actual motor representations as it involves the agent's representations of a desired state and a predicted state that would result from his action. For this reason, Pacherie argues, this comparator and the distal intentions involved in its function must be made in a representational format that is not constrained to motor properties or perceived situational properties. Consequently, this third comparator is assumed to process representations in a conceptual format (Pacherie 2008).

Because of this format, distal intentions can have some influence on the other representations involved in the intentional cascade. The explanation for such an influence is that the different types of representation, expertise and sensory information are all integrated in a Bayesian framework. Consequently, all representations involved in prediction, in feedback, in comparison and other roles are always weighted, based upon previous experiences and learning processes. Distal intentions are apparently capable of influencing the weighing of components of the representations involved in proximal and motor intentions, which is an important part of their efficacy (Pacherie 2008).

The control or regulation that distal intentions exert in this way is being referred to as rational control (Pacherie 2008). Rational control is distinguished here in the dual form of 'tracking control' and 'collateral control', as proposed by (Buekens 2001). It amounts to controlling for the intended effects of an action and not unforeseen side effects. Since this occurs at a larger time-scale than proximal and motor intentions and can involve situational properties that were not foreseen at the time of the formation of a distal intention, the representational format of the other two types of intention would be less effective. Distal intentions can accordingly contribute to the coherence between the agent's reasons, intentions and actions, as they allow a comparison between the action properties as predicted by this rational control and its eventual outcomes and enable the agent to adjust his action if necessary. (Pacherie 2008).

Such comparators can only play their important role in the intentional cascade if the representations involved are sufficiently concrete and precise for such comparisons to be performed. Especially in the case of distal intentions this assumption is questionable, as predictability of all representations involved will decrease as a function of the distance involved to the future. With the decrease of predictability, establishing concrete representations of desired and predicted states, for example, will be more difficult and as a consequence the comparison between the two makes less sense. This may be the reason that in a more recent and adapted version of the intentional cascade,

coauthored with neuroscientist Haggard, distal intentions are considered not so much in terms of rational control but as a form of mental time travel.

With this shift to mental time travel, attention is paid to the source of the contents of distal intentions as to the question how these contents are employed such that they contribute to new intentions. The mental time travel capability is defined as a combination of auto-noesis and the configuration of a particular event: an agent is constructing an event in which he is himself the subject (Pacherie and Haggard 2010).⁴⁷⁵ Explaining how such configuration is carried out, the authors refer to an influential account of mental time travel, according to which memorized events or their features are used, being stored in semantic and especially in episodic memory, as: “one further needs to be able to combine and recombine existing elements” (Suddendorf and Corballis 2007 307).⁴⁷⁶ Distal intentions being formed in this way, differences between them obtain.

For one, distal intentions are not all equally comprehensive and detailed. Depending partly on the extent to which a distal intention relies on a full episodic memory of a corresponding action, it will specify many details of the action and environmental conditions that should trigger it, or not.⁴⁷⁷ In the latter case, the agent leaves many details of the action – like when and how it must be performed – open to a later moment. Indeed, the authors suggest that each agent will find himself somewhere on the continuum between a ‘neurotic planner’ and an ‘optimistic improviser’, depending upon how much he likes to specify beforehand or relies upon later specification instead – with most agents probably alternating between such modes or strategies (Pacherie and Haggard 2010). With these strategies having their differential effects and their benefits and disadvantages, the authors contend that their effectivity relies on the activation of a relevant situational cue as well as a particular and desired action representation, associated with that cue.⁴⁷⁸ Alternatively, instead of using a situational

⁴⁷⁵ In their analysis of distal intentions, the authors distinguish between what-, how-, and when-decisions. For each of these they refer to some evidence that seems to be relevant for that type of decisions, yet fail to present an overarching account that can explain how those three types of decisions for distal intentions are associated, nor how distal intentions can affect – even implicitly – proximal and motor intentions. Nonetheless, they do explicitly reject the qualitative difference that Pacherie had made in her (Pacherie 2008) between the contents of distal and the other intentions (Pacherie and Haggard 2010 82).

⁴⁷⁶ Even though foresight or imagining future events appears to rely largely on episodic memory, the requirements of foresight and episodic memory are not necessarily identical so the distinction between the two remains important (Suddendorf 2010). Besides, it has been argued that in contrast to common opinion, semantic memory can also yield such foresight, even of self-related events (Klein 2013).

⁴⁷⁷ Developmental studies show that planning actions in the future does require mastery of action schemas or scripts, yet this mastery is not sufficient as the future will not be a mere performance of such a schema. From age 5, children were capable of truly planning an action with more detailed preparations, being more flexible to adapt to future contingencies, and so on. This development is partly explained by their increasing employment of detailed episodic memories, not just semantic memories (Atance 2008).

cue, an agent can engage in ‘time-based prospective memory’, aiming to anchor his future action to a particular time (Pacherie and Haggard 2010 80).⁴⁷⁹ In any case, some automatization of such forms of planning of actions is possible.

In their account of distal intentions, the authors combine different theories and concepts. We’ve noticed them referring to mental time travel, which relies upon the recombination of already available representational elements. They did also refer to prospective memory, suggesting that such elements are preserved from earlier experiences and memories. Finally, they also mention in passing how an agent involved in mental time travel can imagine or ‘simulate’ more or less in detail the future situation (Pacherie and Haggard 2010 80). In light of our earlier treatment of simulation as a type of computation that is prevalent in many cognitive functions and our reminder of this just above, it may not come as a surprise that we’ve decided to continue our discussion of empirical evidence concerning distal intentions and narrative in terms of such simulation. And similarly, let us recall how we’re interested in whether such simulation by a planning agent contributes to his sculpted space of actions in a more comprehensive manner than only by way of enhancing coherence and consistency between an agent’s reasons, intentions and actions with regard to just a single intentional action. For in section III.4.1.2, we’ve argued that the agent must be able to support this by considering a single intention in the light of his ‘total web of intentions’ (Bratman 1987 32). Moreover, we found that narrative simulation offers the rich resources required for such weaving of a web of intentions and its consideration in a wider context. A specific example of such a resource are the configuration schemas or models that can be used by simulation processes and which are sometimes borrowed from tradition, relieving an agent of the task of ‘emplotting’ or configuring his own complex distal intention completely *de novo*. The question is therefore what evidence there is that narrative simulation is implemented in such a way that it can indeed contribute to an agent’s sculpted space of actions, like we discussed above?

⁴⁷⁸ The authors observe that the effectivity of distal intentions resembles the effectivity of ‘implementation intentions’ (Gollwitzer and Sheeran 2006 ; Webb and Sheeran 2007), to which we referred earlier in the context of the need for anchoring and specification of a distal action via proximal intentions, in section III.3.2.1. Since the situational cue does also activate the proximal intention and since our concept of distal intention is wider than Pacherie’s, we’ve chosen to refer to implementation intentions in that earlier context.

⁴⁷⁹ Interestingly, the authors refer in this context of time-based action planning that a process like the unconscious action initiation found in Libet’s seminal experiments (Libet 1985) is probably involved in it (Pacherie and Haggard 2010 80). It is indeed plausible to interpret Libet’s findings such that the action initiation occurs as a result of an interaction between a particular distal intention and some sort of triggering cue, with Libet underestimating the efficacy of any distal intention. Cf. the suggestion made in (Roepstorff and Frith 2004) that the subjects accept the action script that has been proposed by the experimenter, adjusting their intentions to include that script and diminishing the role of their own voluntary intentions.

4.2.3 *Simulation and the flexible imagination of a future action*

The claim that agents ‘simulate’ their future behavior by exploiting previously experienced and memorized events was made several decades ago. It was argued that the ‘extraction’ of an action program from the observation of an ongoing action is tightly associated with the construction of a ‘memory of the future’ when simulating a future action. Moreover, both processes recruit allegedly regions in primarily the prefrontal cortex (Ingvar 1985). Subsequently, a more comprehensive simulation theory was presented by Jeannerod, who found overlapping cognitive and behavioral properties between an agent’s motor performances and his motor imagery, suggesting that both processes also largely activate the same neural pathways (Jeannerod and Frak 1999). Yet, even though Jeannerod’s work plays an important part in the intentional cascade framework, Pacherie did not assign a central role to this account of simulation. Instead of focusing on simulation and the fact that representations are shared between functions, the framework assumes the presence of different representations in the cascade that are somehow compared with each other (Pacherie 2008).⁴⁸⁰ However, building upon the arguments given in our earlier discussion of simulation as a general computation employed in the brain we will now scrutinize whether simulation can provide a parsimonious account of how an agent develops complex distal intentions and even the complex narratives that allow him to configure a complex web of events, intentions and actions while considering alternative options for future actions.

Given the present task, we will discuss a specific form of simulation that may be taken as a particular instantiation of the general computational function that simulation is held to be (Barsalou 1999c). Simulation appears to also underly formation of distal intentions (and action plans), by employing flexibly memories of past experiences or their components, like the Structured Event Complexes discussed previously. There is some variety involved in such simulation, which correlates with the large differences that can be observed between such intentions. When comparing distal intentions, researchers have found relevant variation along several dimensions, like their complexity and detail, their likelihood, their familiarity, and so on.⁴⁸¹ As can be expected, depending upon the agent’s previous experiences, the representation involved in a distal intention will be more or less specific along these dimensions (Schacter

⁴⁸⁰ This is somewhat strange as she did collaborate with Jeannerod, writing a paper on agency and simulation together with him (Jeannerod and Pacherie 2004). Although the phenomenological analyses of agency and ownership are important topics in (Pacherie 2008), they could have been articulated also by putting simulation central, as she has done elsewhere (Pacherie 2001).

⁴⁸¹ Dimensions of distal intentions can also be associated. For example, depending upon the future task goal – climbing or photographing - and the temporal distance – sooner or later - , subjects did draw an Egyptian pyramid with less or more detail and in different sizes (Christian, Miles et al. 2013).

and Addis 2007b ; Schacter, Addis et al. 2007).⁴⁸² For example, the level of structure and detail of a distal intention appears to benefit from the amount of experience an agent has with a particular action and the context of its future performance.⁴⁸³ Based upon both psychological, lesion and imaging studies, researchers have proposed that by recombining stored memory features agents are constructing a novel episode from memorized elements. Indeed, particular memory deficits in patients are often associated with particular failures in action planning, with the representations losing detail and complexity (Addis, Musicaro et al. 2010 ; Addis, Sacchetti et al. 2009). In line with the above, the ‘constructive episodic simulation’ hypothesis contends that memory errors should be taken to exhibit particularly the crucial function of memory with regard to future-oriented or simulation processes (Schacter and Addis 2007a). What constructive process is involved in this particular simulation?

If an agent is to respond flexibly, he should be able when simulating a future event or a distal intention to not just depend upon his capability to encode and retrieve memory features but also have the capability to elaborate potential relations between memory features for their flexible recombination.⁴⁸⁴ Indeed do animals and humans alike demonstrate the latter capability. For example, rats were found to be capable of making transitive inference relations between two items that were included in non-overlapping pairs of items: after having been trained to prefer A over B, and B over C, and C over D, and D over E, they will choose also B over D even without training

⁴⁸² This finding was supported by other research, in which subjects had to engage in counterfactual thought. They had to imagine previously experienced events such that their factual outcomes were different from the imagined outcomes, the latter being better or worse, and this with large or little likelihood. Cognitive and imaging evidence shows that such counterfactual thinking largely recruits the same processes and neural networks as engaged in ‘constructive episodic simulation’. Interestingly, unlikely episodic counterfactual thoughts did rely less upon the neural system associated with remembering than upon the system associated with imagining past or future episodes (De Brigard, Addis et al. 2012). Nonetheless, engaging in counterfactual episodic thought has been shown to elicit confusion or distortion of the memory for the original event, confirming that such simulations are constructive rather than reproductive processes with memory playing an important role in those (Gerlach, Dornblaser et al. 2013) Dornblaser et al. 2013.

⁴⁸³ Nonetheless there is a difference between remembering the past and planning for the future, as developmental studies show. Children start only with establishing distal intentions or other forms of planning for future behavior around the age of 2,5 years. By that same age children verbally express uncertainty about future events, make use of modal terms – ‘probably’, ‘possibly’ – and show in their behavior how they’re preparing for future events that are not identical to past events (Atance and O’Neill 2001).

⁴⁸⁴ Hippocampal activity has been taken to be responsible for relational memory, which has been investigated in imaging experiments in which subjects have been asked to remember complete routes instead of mere locations, or to remember word associations, or to remember information related to a test item (Cohen, Ryan et al. 1999). Other research with adults who had to flexibly connect previously learned, yet unrelated pictures, suggests that the hippocampus is particularly involved in the configurating of novel relations (Preston, Shrager et al. 2004). This appears to be particularly the case for quick learning tasks, whereas gradually extraction of relations between memorized features relies rather on cortical activation – which explains the differences between various amnesic patients in such tasks (O’Reilly and Rudy 2001).

this relation specifically. However, rats with disturbed hippocampal connectivity will fail to infer this new relation and fail accordingly to gain extra rewards (Dusek and Eichenbaum 1997). Research with masked word pairs in humans demonstrated again hippocampal activations to be correlated with their behavioral demonstration of an implicit capability of establishing novel relations between separately presented words, without having consciously noticed and processed these words. Hippocampal activity in this task was not limited to encoding but visible during extended periods of time, including at the time of the response task (Reber, Luechinger et al. 2012). But it is not just the hippocampus that is critical for establishing such relations. Developmental studies of children's performance on remembering a past event and simulating a future event suggest an important role for the frontal lobes and executive functions in their developing capability for establishing relations between memory features and making inferences (Richmond and Pan 2013). The moment that such basic capabilities of establishing novel relations between stored memory features are in place, it can be expected that an agent's expertise with particular schemas or configurations of actions can additionally facilitate his simulation of distal intentions with similar representational structure and complexity.⁴⁸⁵

Not only relations between memory features matter, but also the relation to other persons, with whom interaction is often relevant for a distal intentions, matters.⁴⁸⁶ In that case, the simulation must take into account possible responses of other persons as these might influence the action outcomes. Here again, the simulation of a distal intention has been found to cause brain activation patterns that are similar to those typically associated with viewing a situation from another persons' perspective or mentalizing (Buckner and Carroll 2007).⁴⁸⁷ For example, it is advisable when forming a distal intentions involving another person, to take his or her personality into account, if possible. An experiment in which subjects had to imagine particular future scenes

⁴⁸⁵ In line with the evidence mentioned above concerning the role of configuring relations between memorized features, development plays a role in children's capability of simulation of distal actions as well, since this also affects their capability for relational memory (Richmond and Pan 2013).

⁴⁸⁶ Papineau points out that understanding other minds, whether considered in terms of theorizing or simulating, is to a large extent equal to understanding their means-ends reasoning. The evolutionary early occurrence of such means-ends reasoning, he speculates, might have been in the visual imagination of alternative versions of observed actions, rather than in language (Papineau 2006). This would be another reason for the importance of cognitively processing the hierarchical structure of actions.

⁴⁸⁷ The proposal by Buckner and Carroll of 'self-projection' as a central cognitive function shared by theory of mind, imagination and future-oriented thinking has received some criticism (Buckner and Carroll 2007). For example, it has been suggested that a more adequate term for this common cognitive function would be 'scene construction' as it does not assign a central role for self-related processing (Hassabis and Maguire 2007). For similar reasons, we prefer the term 'simulation' to refer to this cognitive function as it suggests an important role for previous experiences, as well.

with the participation of varying persons with different personalities – as presented through vignettes – showed that different brain regions support processing personality specific information with a central role for the mPFC (Hassabis, Spreng et al. 2013). This is yet another indication that the simulation of a distal intention poses extra demands on the cognitive and neural processes in comparison to proximal intentions.

When an agent has formed a distal intention, along the lines mentioned above, how can he prepare its eventual performance, taking into account the importance of relevant affordances involved in proximal intentions when anchoring an intention in a situation? Investigation of ‘implementation intentions’ demonstrate that such affordances be integrated in his distal intentions, if actions like exercising or other healthy behaviors are to be promoted. A distal intention is more effective to the extent that such a simulation specifies not just the goal of an action but also the situational conditions – when, where and how – under which it should be performed.⁴⁸⁸ The representation that results from this is much more detailed and contains information that can serve as one or more cues for the initiation and continuation of the action (Gollwitzer 1993). Effective simulation still requires more of its agents capabilities.

Furthermore, when specifying his implementation intention, the agent should also care for its viability in the simulated future situation and its instrumentality in reaching his goal. In so doing, he can also specify potential obstacles that he might have to face, adding to the efficacy of his distal intention (Gollwitzer and Sheeran 2006).⁴⁸⁹ In addition, several lines of research have shown that motivation matters. For example, study of a memory recollection task has shown the influence of the agent’s motivation during preparatory processes. Items were better encoded and recollected when the expected reward upon recollection was higher (Gruber and Otten 2010). Similarly, even emotional responses to future situations can be regulated through implementation intentions. Such emotional self-regulation can become habitual or implicit, just like other skills do (Gyurak, Gross et al. 2011). In line with such findings concerning the relevance of motivation, research shows that implementation intentions are not capable of ‘trumping’ the agent’s lack of motivation for a goal-directed action. Instead of programming him such that he automatically engages in such action when presented with a situational cue, his motivation with regard to the goal remains a

⁴⁸⁸ Construal level theory contends that when an intention is formulated in rather abstract terms and contains less lower level details, it is perceived as pertaining to the distant future, and conversely (Liberman, Trope et al. 2007). This perception of distance may contribute to its being less efficacious than a more detailed intention, but it is plausible that the lack of detail also impedes the recognition of specific affordances in a future situation.

⁴⁸⁹ Even though we have mentioned several reasons why distal intentions generally, implementation intentions included, rely upon speech processes, it is worth mentioning that additional mental imagery appears to enhance implementation intentions’ efficacy (Knauper, Roseman et al. 2009).

prime factor in determining the efficacy of his implementation intention (Sheeran, Webb et al. 2005).

From these lines of research it can be concluded that forming an effective distal intention relies upon the formation of a relevant and detailed future situation representation and upon forging a strong association of that with a desired action (Webb and Sheeran 2007). Both component processes involved in such simulation benefit from previous expertise with the situation and with the action respectively. As much as this evidence supports our account of the relevance of a sculpted space of actions, a limitation of it is that it mostly focuses on a particular distal intention and does not address potential interactions or even conflicts between multiple distal intentions. Yet in our discussion in section III.4.1.2 we did emphasize the importance of a robust web of distal intentions with an equally stable motivational hierarchy that would enable the agent to conduct his self-governing policies such that he is not easily tempted to reconsider, challenge or even deviate from these policies as this could easily be counterproductive and costly.⁴⁹⁰ As these requirements ask for still more comprehensive cognitive processes than those involved in the simulation of a single distal intention, let us proceed to consider those.

4.2.4 Narrative and additional benefits of the simulation of multiple distal intentions

In the previous section we found that with regard to the simulation of a particular distal intention, we are looking at the flexible configuration of memorized action components. We noticed that such a configuration may vary along several dimensions, like its familiarity, its involving other persons, and so on. Yet we've noticed earlier that it is the heterogeneity of intentions and the corresponding action goals, the plurality of the relevant motivations and norms, and the different temporal scales on which these ingredients play their role in this web of intentions that yields more complexity. Indeed, these factors are challenging the agent's capabilities for achieving global consistency between his intentions and actions (Pacherie 2008). It may be that the mechanisms mentioned earlier may not be sufficient for achieving such results.

Developing a consistent web of intentions that can adapt to these requirements appears indeed to ask for a decisively different 'instrument' than the processes that we have considered so far, like those involved in proximal intentions and (relatively

⁴⁹⁰ Baumeister observes that making distal intentions or implementation intentions also enhances an agent's success in performing his preferred actions when he is actually in a state of 'ego depletion', because such a state has an impact on conscious control yet leaving forms of automatical control intact (Baumeister, Crescioni et al. 2011).

simple) distal intentions. Proximal intentions were explained in section III.3.2.4 with a model that combined contention scheduling with supervisory processing (Norman and Shallice 1986 ; Shallice 2002). However, as we found the CS/SAS model to be limited with regard to the spontaneous generation of novel action configurations, it seems not fit to explain an agent's global consistency.

A more elaborate model was found in the theory of 'Structured Event Complexes' which leaves much more room for the free generation of novel action schemas, facilitated by the neural implementation of such SEC's in the PFC with its rich connectivity to other parts of the brain (Grafman 1995).⁴⁹¹ As developing a consistent web of intentions implies the inclusion of normative and motivational information and information with regard to other agents, it is relevant here to recall again an expanded version of SEC's – so-called 'event-feature-emotion- complexes - that has been developed through studies of moral cognition and which is correlated with a wider set of neural areas involved in emotional reasoning and mentalizing (Moll, Zahn et al. 2005). Such complex representations are also available for multiple cognitive processes. Indeed, such representations can also be involved in distal intentions, relying as they do on memorized action representations, for example when 'constructive memory' enables an agent the simulation of future events or actions (Schacter and Addis 2007b ; Schacter, Addis et al. 2007). Obtaining global consistency between heterogeneous or deciding between inconsistent intentions still requires other processes and resources, however. We've offered a short presentation of narrative simulation earlier as an option. Let us now take a concise look at the cognitive processes required for this.

For such narrative simulation of his actions, an agent must be able to rely again upon his capability of yielding multiple representations – and in different formats – involved in a particular task. Such was also the result of our discussion of the process of Representational redescription, underlying several forms of learning and development (Karmiloff-Smith 1992). This representational redescription process brings along benefits for the agent, such as learning or changing domain specific rules, applying fast and specific modifications, systematic adaptation of the representational domain, and especially the "integration of activities with those of other sub-systems operating on data included in different formats" (Clark and Karmiloff-Smith 1993 492). With narrative simulation carried out in conceptual – linguistic - format, these benefits seem to be particularly pronounced, more so than when action representations would still be in the form of motor representations or in a visual format. Given the extra

⁴⁹¹ Grafman and others contend similarly that Structured Event Complexes do not only support goal directed behaviors but also that "[s]tory grammar knowledge is an example of an SEC." Consequently, they propose to measure 'goodness of story narratives' in brain injury patients (Le, Coelho et al. 2011 119).

demand of global consistency, such benefits are more than welcome.

Now we did argue in the previous Part that there is continuity between conceptual and non-conceptual representations, as the former integrate as (component) representations those non-conceptual, modal representations. Simulation processes employ these not just for the reenactment of sensori-motor states but also for higher cognitive processes that employ language (Barsalou 2003 ; Barsalou 1999c ; Niedenthal, Barsalou et al. 2005).⁴⁹² This holds not only for single memory features or their interrelations but also for the more complex Structured Event Complexes. Research with brain injury patients demonstrate that the impairment of processes that employ these SEC's includes their narrative capabilities, since the generation of a complete and well-structured narrative episode was found to be hampered in correspondence to their lacking action capabilities (Le, Coelho et al. 2011 119). Given the analysis of narrative simulation's functions for an agent's action performances, there is reason to expect that the conceptual format should facilitate his development of more complex and comprehensive structures, indeed.

With regard to narrative simulation, we found Ricoeur describing how through narrative emplotment "goals, causes, and chance are brought together within the temporal unity of a whole and complete action" (Ricoeur 1984 ix). More generally, we found that hierarchical – and heterarchical – action representations are prevalent in complex dynamic systems and their actions, for example in simple grooming behavior in flies (Dawkins and Dawkins 1976), or in more complex nettle leave eating actions of great apes (Byrne and Russon 1998), and in the implicit configuration of automatic actions in humans (Cooper 2003 ; Norman and Shallice 1986) However, the narrative emplotment that Ricoeur refers to is much more complex as it refers to hierarchical structures involving not just such single actions but practices, life plans and even the overall unity of an agent's life (Ricoeur 1992). Indeed are there developmental and patient studies that suggest a correlation between narrative capability and the capability for action organization and coordination. Before analyzing what resources are provided with the conceptual representation of action, let us take a short look at some of this evidence.

⁴⁹² After a careful analysis of multiple lines of evidence in connection with three theses regarding types of groundedness of action cognition in motor abilities, the authors conclude that action cognition relies for both its acquisition and its constitution to some extent on motor abilities, but not completely. Consequently, some action cognition capabilities are not constrained by these abilities (Weber and Vosgerau 2012).

⁴⁹³ This is not the place to discuss preliminary developments that occur in child language learning and their effects on its interactions with its environment. Early development, for example, suggests that when a child is presented with verbal labels of multiple objects, this facilitates their categorization, inductive inferencing and their individuation capabilities, which is observable in its behavioral responses (Xu 2002).

Developmental studies do indeed demonstrate children's increasing capability for hierarchical organisation of representations in different domains like those of manipulation and speech.⁴⁹³ An obvious explanation for this is that both depend upon shared cognitive and neural processes (Greenfield 1991).⁴⁹⁴ With respect to their capabilities of narrative simulation, children develop structures in which increasingly more and more complex 'Goal-Action-Outcome' units figure. This development has been interpreted as being facilitated by the effective chunking or compressing of information with the use of these GAO units (Trabasso and Stein 1994) – which again confirms our previous arguments for the importance of chunking for effective and adaptive processing.⁴⁹⁵ Apart from cognitive maturation it is the use of conceptual elements in narrative that contributes to these developments.

Since actions are not just composed of such relations between goals, actions and outcomes, but many psychological elements are involved as well, it is surprising how well children learn to understand, predict and explain human actions at an early age. An explanation for the acquisition of this skill is presented with the 'Narrative Practice Hypothesis' (NHP), developed by Hutto. Critical of the claims of theorizing accounts of action understanding and reviewing many developmental studies, the NHP purports that a child's sustained experience with narratives familiarizes it with the numerous factors involved in an agent's choice for a project: "[o]ften their reason for taking a particular course of action is influenced by their character, larger projects, past choices, existing commitments, ruling passions or unique circumstances and history" (Hutto 2007 35). Studies of mother-child interactions reflect this hypothesis and show that the complexity and contents of their joint story telling does influence the child's capability of understanding human action in psychological terms several months later (Turnbull and Carpendale 2009). What narratives provides the child with, so it seems, are coherent representations of both observable, indirectly observable – psychological, cultural – or even unobservable components that together allow it to make sense of actions. With these same representations, so we may assume on the basis of previous arguments, can it develop its own coherent narratives and multiple action plans. Let us not overlook the fact that this capability will not remain in place forever, unfortunately.

⁴⁹⁴ Meanwhile, evidence of involvement of Broca's area in facilitating hierarchical representations in action, language, and other domains supports this argument (Arbib and Bonaiuto 2007 ; Fadiga, Craighero et al. 2009 ; Hagoort and Levelt 2009 ; Koechlin and Jubault 2006).

⁴⁹⁵ There are several strategies that can be implemented in narratives for obtaining 'semantic reduction'. Comparison of narratives shows that simply applying Temporal connectivity to a story is less successful in such semantic reduction than the strategy of Action structure, with Causal connectivity occupying a middle position (Giora and Shen 1994). Hierarchical representation and chunking of information is indeed considered to be a most important form of 'problem solving' that narrative bestows upon human agents (Herman 2009).

Indeed, it has been observed in several studies that, conversely, aging is correlated with a decrease in the quality of narrative simulation. As the complexity of narrative simulation requires optimal executive functions and their declines in the elderly, their narrative tends to lose coherence, to be worse in integrating novel information and tracking multiple characters, to contain more irrelevant information, for example. From a study of adults of different ages, investigators conclude that narrative quality can indeed be taken as a general indicator of capabilities for cognitive and behavioral organization (Cannizzaro and Coelho 2012). Similarly, traumatic brain injury impedes narrative organization as was shown in a story re-telling test in which patients had more difficulty in providing their story with adequate structure. Again, impaired executive functions are held responsible for this, which was found in this study to be also correlated with decreased results in a card sorting task (Mozeiko, Le et al. 2011). After this sidestep to the fragility of the human capability for narrative simulation, we will take a closer look to the linguistic resources that are employed in forging coherent narratives while no longer subject to the constraints that are given with other representational formats.

When represented in linguistic format, an agent can easily represent actions irrespective of their temporal modality – whether past, intended future, or imagined actions – and freely ‘act’ upon these representations in many ways.⁴⁹⁶ For example, given the recursivity that language brings along, an agent can indeed embed his action representation in other – linguistic – representations of actions or events, yielding him many new options.⁴⁹⁷ When representing his action in an uncommon environmental context, for example, the agent is invited to consider whether new objects or tools could be integrated in the action, or to compare different actions via such representations.⁴⁹⁸ Or he can ascribe a particular action intention to another

⁴⁹⁶ In their target article on foresight or mental time travel, the authors even compare this capability with a theater production involving language-dependent contributions of a playwright, actors and a broadcaster. Acknowledging that mental time travel does not per se require language, they do emphasize that both MTT and language involve the “capacity to transcend the present in an open-ended and flexible manner” (Suddendorf and Corballis 2007 310). As a result, co-evolution of the two might have occurred. Investigating their development, Nelson confirms that MTT and language are interdependent, with an important role for cultural narratives in such development (Nelson 2007).

⁴⁹⁷ Though Pacherie (Pacherie 2008) argues that distal intentions have to be made in a conceptual format, she does not explicitly take further linguistic features like syntax and recursivity into account, which are contributing to the benefits of representational redescription we mention here. Bruner explicitly mentions both the ‘hermeneutic composability’ and the ‘narrative accrual’ as characteristics of narrative that refer to the fact that narratives not only internally consist of nested components, but are generally also embedded in socio-cultural webs of narratives that contribute to ‘narrative realities’ (Bruner 1991). Such narrative recursivity knows hardly limitations once narratives are written and contained in ‘external symbolic storage’ and must no longer be contained as engrams in biological memory (Donald 1991).

⁴⁹⁸ As Gerrig argues, ‘the rich get richer’ since those readers that were in the possession of relevant representations are better capable of integrating, maintaining and later recalling novel information as well (Gerrig 1993).

agent, challenging him to speculate about possible motivations or reasons that this person could have for it – potentially even sharing the intention with several others. Another option that presents itself when actions are represented as stories, is that they can become involved in what Shore refers to as ‘analogical schematization’ processes in which information and insights are carried over to different domains (Shore 1996), for example when a particular action is metaphorically applied with something else, like with performing an opera. In sum, in comparison to another medium for simulation like visual imagination, linguistically representing actions and intentions offers a wealth of options for redescribing these representations.⁴⁹⁹ As a result, employing linguistic representation for narrative simulation of action, the agent can simultaneously embed it in a more comprehensive web of distal intentions while still enhancing the global consistency between these.⁵⁰⁰ Indeed, there are highly specific linguistic features that are conducive to such consistency.

When developing a comprehensive hierarchical structure containing his web of intentions or action plans, the agent is in need of features that enable him to relate and connect action components, especially since it may be that not all components allow immediate integration in this structure.⁵⁰¹ All languages contain many words that can indicate one or another form of coherence between actions. Most effective are those words that allows an agent or observer to point out – or to question, for that matter – the causal connection between intentions and actions, like ‘because’, ‘for’, ‘nonetheless’, and so on. Evidence from several experiments demonstrate the cognitive benefits that using such connective words yield as they facilitate in subjects the understanding of a

⁴⁹⁹ Mental imagery can also have an impact on several behavioral or experiential measures in subjects (Jeannerod and Frak 1999 ; Kosslyn 2008). Yet mental images have certain limitations, different from linguistic or conceptual simulations. For example, subjects are unable to imagine ambiguous images, suggesting that self-produced images do not require further interpretation – which is different from percepts or from linguistic stimuli (Chambers and Reisberg 1985). Others have argued that reinterpreting – ambiguous - behavior is a typical human capability, dependent upon language (Povinelli and Barth 2005).

⁵⁰⁰ Conversely, long term memory deficits have been associated with correlations between impairments in simulation tasks and speech tasks, which make patients produce results with less inter-item relations and less coherence in the events they’ve constructed (Romero and Moscovitch 2012). Generally, aging adults produce also less coherent and less efficient narratives than young adults. However, this effect is mitigated in aging adults with a larger vocabulary, which is probably helpful in constructing coherent and efficient narratives (Juncos-Rabadán, Pereiro et al. 2005). Even though much of the research reported on simulation either uses verbal stimuli or verbal reports, correlations between reported speech and simulation capabilities appear to be not just mere consequences of such experimental designs but to point to real interdependencies between these capabilities.

⁵⁰¹ One could argue that the features mentioned here, or the indicators mentioned below, in part belong to metarepresentational content as they can contain information about the informational content of the action representation itself – for example by indicating the agent’s belief or adherence to a particular representation component. It is argued that such metarepresentational content even need not be conceptual while still assisting an agent to improve and learn a representation in a more targeted way (Cleeremans 2006). Indeed, this can be carried further by arguing that the dopamine Reward Error Prediction signals are in fact carrying non-conceptual metarepresentational content (Shea 2012).

described series of events and induces better memorization.⁵⁰² Differences in response times demonstrate how such words help to raise expectations for future information and to strengthen relations between utterances (Mak and Sanders 2012). Other coherence indicators do not have clear parallels in observable action properties but are more unique to language, like words that indicate polarity– ‘but’, ‘whereas’ – or that present an additive relation – ‘and’, ‘while’. The use of such words also result in facilitation of processing narrative simulation of actions (Knott and Sanders 1998).⁵⁰³

Since distal intentions are particularly complex due to their being extended into the future, the role of temporal structures in narrative simulation is particularly relevant. One of the main features of narrative is its use of linguistic resources to foster expectations and anticipations. Not just descriptions of intentions and actions are capable of instilling these, but even simple and canonized formulas about temporal structures (‘In the beginning...’) can do so (Gerrig 1993).⁵⁰⁴ Indeed do behavioral results show that there are specific words which are facilitating the comprehension of such temporal structures in action descriptions. Naturally, such descriptions do not need to follow the rigid sequential order that actions must pass off in reality, which adds to their compactness (Zwaan 2008).⁵⁰⁵

Still other linguistic resources can help an agent’s narrative simulation of his web of distal intentions to become more coherent while still reducing the amount of information that needs to be processed. Whereas observation or performance of actions might not reveal all potential differences between these regarding the attitude of the agent to these, their narrative simulation can do so. When an agent considers his actions and intentions, he can use many different ‘indicators of self’ to express his position regarding them for himself and others. There are several ‘agency indicators’ that allow him to can express in a differentiated way whether an action was voluntarily or not. Similarly, he can indicate his commitment to the action, its social reference and its evaluation of it. Moreover, he can also explicitly indicate the coherence of an action with his other commitments, evaluations and the like (Bruner and Kalmar 1998). Such

⁵⁰² This aligns with evidence that better hierarchical encoding of an action during observation by an observer correlates with his better recall and imitation of it afterwards (Zacks, Speer et al. 2007).

⁵⁰³ When students were asked to develop deceptive autobiographical narratives, these narratives were found to be less complex and to contain less cohesion indicators. The investigators interpret their result as demonstrating that ‘narrative distance’ has an impact on the quality of narrative (Bedwell, Gallagher et al. 2011).

⁵⁰⁴ Ricoeur emphasizes the fundamental role of narratives’ temporal structures, as these often are not representing actions and events in chronological order, nor completely a-chronologically. Instead, different schemas for such structures are available (Ricoeur 1980).

⁵⁰⁵ Zwaan argues in favor of a simulation theory along the lines of Barsalou’s theory and asks for future research on “how mental simulations are orchestrated from moment to moment by the remarkable and often underestimated subtlety of human language” (Zwaan 2009 1149).

indicators can help both himself and others to judge this coherence and perhaps to modify it.⁵⁰⁶ In that case those actions that are dear to the agent are put more central in the web of his intentions whereas others are put more at a distance. In that case, other indicators might need to be adjusted as well, inviting him to further sculpt the space of his actions.

As argued above, when an agent engages in narrative simulation he has at his disposal the representational format and resources that critically contribute to the representational redescription process that is implied in the explicitation of action representations. Consequently his actions, intentions and plans can be integrated in much more comprehensive representations without necessarily losing global consistency. Obviously, irrespective of the chunking and coordination involved in this process, narrative is still cognitively demanding, as testified by the increasing activation of particularly the right hemisphere in humans when completing a narrative – taken to indicate the efforts of synthesizing these narrative components into a coherent whole (Xu, Kemeny et al. 2005). It is therefore not surprising that there is a socio-cultural dimension involved in narrative simulation, which again facilitates and contributes to this process. Obviously, this dimension was already at stake in our previous discussion but we will focus more particularly on the socio-cultural nature of narrative in the next section.

4.2.5 The socio-cultural nature of some schemas for narrative simulation

It has been argued that the phylogenetic development of the modern human mind takes place in what can be characterized as a mimetic phase, in which public and communicative mimetic skills become increasingly important (Donald 1991).⁵⁰⁷ Imitation and imitation learning of contents that are specific to a particular group or culture are playing an ever more prominent role in human lives since that paleontological phase and are being associated with increasingly complex hierarchical representations of actions.⁵⁰⁸ Such connection between mimesis, culturally specific

⁵⁰⁶ Research in which subjects had to construct deceptive (pseudo-)autobiographical narratives shows that producing such false narratives is cognitively taxing and results in less linguistic complexity, less referential coherence and a greater distance between narrator and narrated self in comparison to truthful narratives (Bedwell, Gallagher et al. 2011).

⁵⁰⁷ Donald's phases have been correlated with the ontogenetic development of children, in which narrative and the co-construction of narrative by children and parents does indeed play an important role (Nelson 1999). Later research confirmed that when children later construct their individual autobiographical narratives, they build upon the schemas that are socio-culturally available, which partly explains intercultural variability of the onset, quantity and quality of such narratives (Nelson 2003).

contents and intentional action has been at the centre of Ricoeur's work as well. In section III.4.1.4 we paused for a moment with his analysis of hierarchical levels of action, ranging from practices through life plans to the comprehensive unity of life, which were found to be to some extent determined by socio-cultural influences. The criteria of expert practices, or the nature of a parent's life plans, or the structure of one's autobiography are not made up by isolated and a-historical individuals (Ricoeur 1992). The same holds, Ricoeur argued in his volumes on 'Time and Narrative', for the narratives that humans tell, which generally comply to some extent with socio-cultural schemas with a long history (Ricoeur 1984-88). The use of such shared schemas again brings several benefits, both for an agent simulating his actions internally and for agent who are jointly simulating or discussing an action. The education of children consists partly of familiarizing them with such narrative schemas.

Indeed, according to the Narrative Practice Hypothesis that was mentioned in the previous section, children are being raised while engaging with their caregivers and others in narrative practice, which provides them with a shared basis for action understanding and narrative simulation of actions (Hutto 2007). More generally, narrative practice enhances not only the organization and consistency of actions of an individual agent as the exchange of such representations can also be considered as a collective cognitive activity that enhances the coordination between agents and their joint actions (Hutchins and Johnson 2009). Even in a simple perceptual task that two agents have to carry out it can be observed that dyads benefit from developing shared linguistic tools for their coordination, adapting to each other's way of talking, for example (Fusaroli, Bahrami et al. 2012). Reviewing literature from several lines of research, Tylen a.o. conclude that language can be a 'tool for interacting minds' bringing along four important benefits as linguistic representation: "extends the possibility-space for interaction, facilitates the profiling and navigation of joint attentional scenes, enables the sharing of situation models and action plans, and mediates the cultural shaping of interacting minds" (Tylen, Weed et al. 2010 3). Again, we can observe how benefits in two directions emerge: at the one hand, the space of options – this time for joint action - is enlarged with conceptual representation of action, while at the other hand language provides resources that help interacting agents to jointly constrain and determine a relevant sub-space of options, enhancing their consistent interactions.⁵⁰⁹

⁵⁰⁸ A review and comparison of different lines of evidence, including the analysis of paleolithic stone tools, imaging studies of stone tool making and language processing, suggests that what connects the developments in stone tool making and language is their increasingly complex and hierarchical structures. The authors contend that these associated developments together will have affected the complexity of human intentional action and intersubjective learning generally, as can be derived from other archeological findings as well (Stout and Chaminade 2009).

As we've referred previously in this Part to research demonstrating the relevance of schemas or scripts, let us pause here for considering the relevance of culturally specific narrative structures.

Sculpting his space of actions such that it enables an agent to easily interact with other agents and his environment should be easier if it involves constraints that are not merely idiosyncratic but shared with his environment. This aspect of narrative is referred to in three of Bruner's listed ten narrative's features. The list includes the relevance of genres of narrative, with their specific structures and components, facilitating recognition and understanding of a recounted narrative. Furthermore, narratives contain normative elements having to do with cultural legitimacy of its contents and structures, which also constrain the expectations of both story tellers and listeners. A third aspect that merits mentioning and that is related to the other two is narrative's canonicity. Even though a narrated action must not always concur with a canonical action and can even breach it, the presence of shared canonical narrative structures does facilitate simulation and understanding of actions between subjects (Bruner 1991)⁵¹⁰ This facilitation consists mainly of the coherence between on the one hand individual intentions and actions and those of other agents and cultural institutions on the other, for which explicitly sharing, narrating, relevant representations seems to be an effective way.⁵¹¹ Consequently, one could consider the cognitive act of story telling therefore primordially a social act and the result of this a kind of 'narrative entrainment' of different agents (Caracciolo 2012). In that sense, a narrative can be considered as a more elaborate and complex form of the template with open slots that were found to support sensori-motor skills in the beginning of this Part and that contribute to the process of chunking complex information and sculpting the agent's space of actions.

Indeed, narrative – enabled by the features mentioned in the previous section – is

⁵⁰⁹ Clark sheds light on the process of 'cognitive niche construction' for which humans use language and other means like spatial arrangements and tools. Important benefits of this niche construction are not just the expansion of options for action and interaction but also the reduction of complexity according to his account (Clark 2008).

⁵¹⁰ It appears that one can not only determine a limited set of narrative contents and structures that are prevalent within a particular culture, a brave attempt has even been made to classify a surveyable collection of narrative components which are largely shared between different cultures (Propp 2003). Ricoeur critically discusses Propp's 'logicization' and 'dechronologization' of narrative in (Ricoeur 1985).

⁵¹¹ Trabasso describes how mothers' narration of stories to children functions as a scaffolding for their development of more complex action representations. Such narration employs socio-cultural models which help children to learn action planning while simultaneously socializing them (Trabasso and Stein 1994).

⁵¹² Reviewing recent contributions to neurohermeneutics approaches to culture, emphasis was laid upon the different skills – ranging from motor to symbolic practices – associated with a particular culture (Winkelman 2003).

said to “provide[...] templates for behavior in physical as well as moral-cultural worlds” (Herman 2003 182).⁵¹² Not surprising is the fact that the notions of script and schema, discussed above, have been introduced with reference to socio-culturally specific actions like coffee making (Cooper, Schwartz et al. 2005) or visiting a restaurant (Schank and Abelson 1977). Such schemas contain complex action representations in which several components actions, agents, and environmental props figure, which are interconnected through expectations, dependencies and the like. On a more broader scale and in the wake of the ‘cognitive turn’ that the social sciences have made in the last decades, sociologists and anthropologists have taken an interest in the cognitive effects of socio-culturally shared representations (Shore 1996). Although we’ve observed in our discussion in Part I of Marr’s three levels of analysis that the algorithmic implementation of a particular task and its neural implementation cannot be derived unambiguously from each other, changing a task’s representational format often does influence the cognitive and neural processes required for its performance.⁵¹³

Do cultures indeed differ with regard to those higher levels referred to by Ricoeur as practices, life plans and the overall unity of an agent’s life (Ricoeur 1992)? In a review of ‘neuroanthropological’ research, reference has been made to the fact that the Structured Event Complexes, to which we’ve referred repeatedly in this Part, are in many cases determined by socio-culturally specific contexts and actions (Dominguez Duque, Lewis et al. 2009). With regard to practices and life plans, the differences in contexts and norms between cultures are more prominent and have been implicitly present with regard to the levels of motor intentions and proximal intentions.⁵¹⁴ However, with regard to the unity of an agent’s life, it seems to be more difficult to investigate how socio-cultural influences can modulate the cognitive and neural processes associated with his self-representation. Perhaps still with serious limitations,

⁵¹³ Reviewing cultural neuroscientific results, the authors conclude that cultural differences can have not just a functional but even a lasting structural impact on brains (Han and Northoff 2008). It should be noted, though, that comparing cognitive and neural processes in subjects from different cultures brings along some fundamental conceptual and scientific challenges (Roepstorff 2013 ; Roepstorff and Frith 2012). Nonetheless, there is increasing evidence that cultural differences do influence both cognitive, behavioral and neural processes in subjects (Ames and Fiske 2010 ; Chiao, Cheon et al. 2013 ; Choudhury and Gold 2011 ; Dominguez Duque, Lewis et al. 2009 ; Losin, Dapretto et al. 2010 ; Nisbett and Miyamoto 2005 ; Vogeley and Roepstorff 2009).

⁵¹⁴ Taboos, for example, are present in all cultures and predominantly regulate bodily interactions and food. Although it may be that many food taboos can be related to experiences of disgust in connection with particular – rotten – foods, it is obvious that additional social and moral values and norms have become associated with such foods. As a result, the representation of a taboo can become ‘enriched’ with normative, social and religious components that subsequently engage many different cognitive – and social – mechanisms (Fessler and Navarrete 2003). As a result of such processes, taboos can become strongly generatively entrenched and have a wide-ranging impact on an agent’s web of intentions and action plans.

there has been developed a line of research that can offer us some preliminary insights in this.

There have been made several investigations into differences in self-related processing or self-referencing between subjects from different cultures. Although it must be granted that the tasks involved in such investigations are relatively simple and do not amount to narrating an autobiography, neural, cognitive and neural evidence does suggest that the representation of self in relation to others is not uniform across cultures. For example, correlating with the broad distinction between a more collectivist Asian culture and a more individualist Western one, students from different backgrounds engaging in self-referencing categorization tasks were found to display different cognitive and neural response. Cognitive and neural responses to mothers and unknown persons were clearly distinct from responses to self in Western students, whereas in Chinese subjects the line was drawn between mother and self versus unknown persons (Zhu, Zhang et al. 2007).⁵¹⁵ Intriguing results with Chinese buddhists compared with Chinese christians suggest that the long-time exposure to religious narratives and practices differing in terms of their self-focus or no-self doctrine, respectively, does influence cognitive and neural responses to the self (Han, Gu et al. 2010).⁵¹⁶ However, other research demonstrates that such cultural differences in self-representation are modifiable, for example by individual endorsement of cultural norms and – implicitly – by priming (Chiao, Harada et al. 2010). More directly, self-identification with a particular race results in larger empathic responses with other racial group members and increased activations of a large set of neural areas with that is involved with more than only empathy (Mathur, Harada et al. 2012).⁵¹⁷ In fact, as we will see in the next section, self-representation or self-identification is correlated with a large neural network which appears to play a more generic functional role instead of having a specific function.

⁵¹⁵ Although humans may share a ‘trans-species core-self’ responsible for fundamental self-referential processes with other animals, this does not stand in the way of its being sensitive to environmental and social influences (Panksepp and Northoff 2009). Indeed, this concurs with our argument that dynamical and adaptive systems are capable of integrating environmental information in some way or another.

⁵¹⁶ The prevalence of a hierarchical or more egalitarian societal norm also influences the perception of others and the distinction between out- and in-group members. This has an influence on cognitive and neural empathic responses, with subjects from a more egalitarian society displaying less distinction between out- and in-group members (Cheon, Im et al. 2011). In this context, too, manipulation of the cognitive strategy of subjects – for example by demanding different types of categorization – can modulate such responses on all levels (Sheng and Han 2012).

⁵¹⁷ There are several cognitive strategies available which influence the perception of and empathic responses to differences in group membership. Mirror neuron systems are involved in these responses and it appears that their activations can be modulated via the use of such cognitive strategies, contradicting simplified statements of the ‘hard-wired’ or ‘innate’ nature of our social, empathic brain, as we’ve argued elsewhere (Keestra 2012).

To resume the previous sections, socio-cultural norms and representations can have an impact on behavioral, cognitive and neural responses, confirming the relevance of narrative - containing such socio-cultural contents - for an agent. The agent's structural self-perception can even be affected by it as other research shows. Most agents tend to think of themselves as being autonomous, integrated and separate from other selves. However, as is evident from many foundational narratives, in some cultures a more porous and disembodied characterization of self is prevalent, making dissociative phenomena like trance or possession acceptable and not dismissed as pathological. Such cultural narratives appear to influence automatic and controlled cognitive and neural processes like those underlying attention, perception and emotion, related to such dissociative phenomena (Seligman and Kirmayer 2008).⁵¹⁸ The narrative that an agent, who is part of such a culture, will develop about himself will likely display many differences compared to another narrative in which his interactions does not include interactions with spirits of ancestors and the like.

Given the mutual influences between socio-cultural narratives and the individual agent's cognitive processes, it has been argued that we should not be surprised that the representations involved in such narratives tend to be reproduced in a relatively stable way, even though they undergo modifications throughout cultural history (Sperber and Hirschfeld 2004).⁵¹⁹ Such characteristics of the socio-cultural transmission of representations may rely particularly upon the hierarchical structure of these representations, again. Several lines of evidence suggest that humans are subject to a 'hierarchical bias' as during transmission processes the higher, more abstract levels of action representations tend to become increasingly important whereas the proportion of lower level information decreases (Mesoudi and Whiten 2004). Given the potential for abstract representations provided by language, this may explain why narrative structures can spread relatively easy and maintain stability over such long periods of time, influencing the behavioral, cognitive and neural processes of large groups of agents.

Having started these sections with the relatively simple simulation of a single future action, we have now arrived at underscoring the importance of the narrative simulation of the agent's more complex web of intentions. At the end of this last Part, let us take

⁵¹⁸ Attention could also be paid to the use of psychoactive drugs in some shamanist cultures, further enhancing the experiences of trance and possession and influencing neural processes (Whitley 1998).

⁵¹⁹ Sperber defends a view of a 'massively modular mind' and contends that his notion of an epidemiology of representations depends upon this view of the mind (Sperber 2005). Apart from the fact that he seems to take the notion of modularity even stricter than Fodor required (Fodor 1983), our account of the brain as a complex and dynamic mechanism that is capable of kludge formation can explain such epidemiology without implying such - problematic - modularity.

a final look at some empirical studies concerning the implementation of simulation – particularly narrative simulation. An important question is whether we will find kludge formation at this stage, or not. Given the pertinence of narrative to the agent's wider web of intentions and action plans, it seems difficult to expect the formation of a particular (component) mechanism responsible for processing such complex and multifaceted representations. Moreover, Ricoeur has emphasized that the narrative of an agent's life is never finished but requires continuous recounting and modification in view of his new or revisited experiences and actions (Ricoeur 1991b ; Ricoeur 1992). Implementing this in a particular mechanism appears to be quite impossible, or is it?

4.2.6 Narrative simulation and some evidence for its implementation

After considering motor, proximal and simple distal intentions, we have now even touched upon narrative simulation as another process in which action representations are involved. We have defended how over time an agent's space of actions is sculpted as his growing expertise with particular actions leads to the formation of kludges, correlated with relevant representations of his expert actions. Whether relatively simple templates of sensori-motor representations or the more complex Structured Event Complexes, for example, his expertise results in flexible yet fast responses in accordance with his established intentions, even without exerting conscious control. Our plea for extending this framework to distal intentions may have caused some wonder, as distal intentions are usually considered to be articulated consciously and rationally. However, we can still ask: are such distal intentions perhaps also capable of becoming generatively entrenched in the complex mechanisms that are underlying an agent's cognitive and behavioral responses? Can distal intentions contribute to a sculpted space of actions in such a way that conscious and rational decision making is not always required for these intentions to influence his actions? Of course, we are not defending a position which holds that an agent's narrative simulation of his actions will always and comprehensively control all his actions.⁵²⁰ Nonetheless, as we've argued that sculpting the space of actions is a process subject to multiple influences, it is still relevant to consider the implementation of narrative simulation. Given the complexity of the task of distal intention formation and narrative simulation, we may expect their implementation to be rather complex, too.

⁵²⁰ Indeed, for improving an agent's moral behavior it is usually not sufficient to improve his narrative, perhaps in part because of a lack of overlap of the neural processes that underlie our narrative capacities and those involved in action planning and performance (Bickle 2003). On the other hand, there are several cognitive strategies that involve narrative simulation and have an impact on action, like implementation intentions, counterfactual reasoning.

Before looking more closely at such implementation, we will consider some indices that cognitive decline or other pathologies are often associated with impairments of narrative and of action. This concurs with our earlier observation, for example in section III.4.2.4, that the domains of action and speech share some cognitive and neural processes. For example, patients with Alzheimer's dementia are increasingly losing the capability of generating the lower level details of action representations in both domains (Addis, Sacchetti et al. 2009). Studies suggest that it is the decrease in goal-directed executive function in ageing adults that correlates with changes in their narrative's structure, which becomes less coherent, less informative, less complete and more confusing, probably due to less successful implementation of organizational, hierarchical schemas (Cannizzaro and Coelho 2012). Similarly, schizophrenic patients, characterized among others by their action disorganization, are making less action plans and have more difficulties in simulating the details of future events (de Oliveira, Cuervo-Lombard et al. 2009).⁵²¹ Such declines appear to be foremost a result of impaired capability of developing comprehensive and complex action representations. On the other hand, these same patient groups suffer from impaired self-experience and self-concept, concurring with the fact that in narrative simulation is essentially about an agent and his actions.

Concurring with this patient evidence are studies with other patients, for whom narrative contributes to improvements in mental and physical health. Patients suffering from traumatic experiences were shown to benefit from writing exercises. Especially those patients who created increasingly coherent narratives about their experiences – indicated by their use of insight and causal words – improved significantly (Pennebaker 1993).⁵²² Extending this finding with a review and experiments, Klein argues that it is particularly the increased coherence of patients' narratives that is responsible for such improvements. Such change in coherence usually entails the transformation of the mental representations that patients have, also modifying the stress-related components. Furthermore, narrative coherence also limits the ability of intrusive memories to disturb patients (Klein 2003).⁵²³ Although Ricoeur may not have had these patients in mind, the evidence concurs with his emphasis of the importance of

⁵²¹ As we will elucidate shortly, several processes are involved in narrative simulation. In schizophrenic patients, it is suggested that their deficits in reality monitoring and in strategic memory retrieval contribute to their difficulties in simulation tasks (Raffard, D'Argembeau et al. 2010).

⁵²² Such evidence confirms the 'Immersed Experiencer Framework' which emphasizes parallels between real-world experiences and text-processing, since in the latter situation a simulation – along the lines of Barsalou's theory (Barsalou 1999c) - of the former is established (Zwaan 2004).

⁵²³ In her review of available evidence of the beneficial results of expressive writing for patients, Klein mentions also unexpected results like reduced blood pressure, improved immune function, and improved working memory (Klein 2003).

narrative for the agent's life: "If my life cannot be grasped as a singular totality, I could never hope it to be successful, complete" (Ricoeur 1992 160). Let us first consider the implementation of narrative, before focusing more in particular on the potential implementation of self-representation, which plays such an important role in narrative.

According to Mar's review of the literature (Mar 2004), the comprehension and production of narrative relies on many different neural areas, recruited for three broad component cognitive processes: memory encoding and retrieval, the integration of information in order to create coherence, and further elaboration or simulation. Consequently, the responsible neural networks must include at least hippocampal and working memory areas, for the first process. Depending on the kind of information that must be integrated, a wide range of processes are candidates. In any case, a representational structure like Grafman's Structured Event Complex must be employed for maintaining information and integrating further information in it. Simulation of predictable events requires processes that enables an agent to draw inferences or raise expectations. These last two processes rely on large prefrontal areas, responsible for ordering and selection of contents (MPFC)⁵²⁴ and for constituting temporal order and offering working memory (DLPFC). Moreover, temporoparietal and temporal regions are involved, contributing to mentalizing processes, in which MPFC is also involved. Finally, the posterior cingulate cortex appears to be recruited for auto-narrative awareness, enabling the narrator to truly experience the narrated simulation, including its affective aspects (Mar 2004).

However, not all evidence converges with this picture and more detailed investigation and interpretation of specific cognitive contributions to narrative simulation still stand out, as is the case with their neural implementation. As an example, we will mention how several investigations help to specify the processes recruited for coherence building in narrative, even though they do not all point into the same direction. Imaging subjects during reading comprehension tasks did suggest that DMPFC is involved in understanding a narrative's coherence. Yet other studies reported DMPFC activations also in incoherent sentence conditions as well as in theory of mind tasks, suggesting that those activations are contributing to still unidentified cognitive tasks in narrative comprehension (Yarkoni, Speer et al. 2008). More generally, imaging experiments with subjects performing comprehension tasks at different levels of narrative – ranging from words via sentences to narrative – showed that the role of both hemispheres can be somewhat differentiated. It appears that particularly for forging a coherent

⁵²⁴ This concurs with results in which MPFC activation appeared to be recruited for mediating attention in the simulation of distal intentions (Okuda, Gilbert et al. 2011).

representation of all narrative components, right hemispheric activation is required (Xu, Kemeny et al. 2005).⁵²⁵ As could be expected from the contents of a narrative – consisting of the synthetic employment of heterogeneous elements, as we've learned above – its implementation is still contested area. What, then, should we expect with regard to the implementation of the agent's self-representation in narrative? Given its rich associations with memories, intentions and plans, emotions and motivations, expertise and knowledge, it seems implausible to expect an implementation that can lend itself to a form of kludge formation, as well. However, we will suggest that there are indications of the latter, indeed.

As mentioned earlier in the context of the simulation of simple distal intentions, the default-mode network (DMN) plays a role in such simulation (Buckner and Carroll 2007 ; Schacter, Addis et al. 2008). For some time, it has been assumed that this DMN is actually anti-correlated with task-related activities in the brain, leaving the functional role of it undecided. But this dichotomy has become a matter of debate (Fox, Snyder et al. 2005). Indeed, even in simple cognitive tasks that are 'perceptually decoupled' from the immediate context, this DMN is recruited. However, this DMN recruitment does then affect negatively the goal-directed actions that the agent is performing at the same time – a negative effect that does suggest a distinctive role for DMN for tasks that do not focus on present external, environmental goals (Smallwood, Brown et al. 2012 ; Smallwood, Tipper et al. 2013). So it is particularly with regard to tasks that require some internal focus and self-representation, like in distal intention and narrative simulation, that we should expect DMN activations, as it is held to be involved in maintaining information and its processing in interpretive and predictive tasks (Raichle and Snyder 2007).⁵²⁶ It should be noted in this context, again, that these tasks do not only involve the representation of relevant information, but also some meta-representational capability involved in its evaluation and interpretation. DMN involvement in tasks requiring these capabilities is confirmed by different lines of research. We may consider this complex yet distinct network to be a kludge that is recruited in several mechanisms that are responsible for some important cognitive tasks.

For example, DMN is activated when agents were asked to simulate how they would solve goal-directed problems sometime in the future. In addition, however, executive regions were recruited, reflecting probably the representations that are relevant for the

⁵²⁵ In addition to the processes contributing to narrative simulation there may be a role for processes that check for the coherence or accuracy of narrative.

⁵²⁶ Nonetheless, a review of DMN activations in patients suffering from a variety of disorders suggests that interferences of DMN activities with external goal-related tasks are correlated with several disorders (Broyd, Demanuele et al. 2009).

problems at stake (Gerlach, Spreng et al. 2011), like the Structured Event Complexes discussed earlier. Also in less specific simulation tasks, DMN is recruited, as when agents are challenged to engage in narrative fiction, in autobiographical narrative or in mentalizing tasks (Spreng, Mar et al. 2009). It might be speculated that it is indeed the synthesizing into a coherent narrative of heterogeneous types of self-related information that relies upon such DMN activations. Such speculation receives initial confirmation from an imaging experiment demonstrating particular involvement of DMN towards the end of a narrative, when the task of its integration is particularly relevant (Egidi and Caramazza 2013). Such recruitment during narrative seems to be implied because of the rich connectivity of this network with cognitive, affective and mentalizing systems. Concurring with this is the fact that when a subject has difficulty with particular narrative tasks, his DMN network is modulated accordingly (Wilson, Molnar-Szakacs et al. 2008).⁵²⁷

Even if the DMN is relatively de-activated when ongoing tasks are activating specific networks, such experiences should at times have a subsequent effect on it. Indeed, the agent's experiences may at times need to be integrated in this network as it is involved in processes that are relevant for his forming distal intentions and narrative simulation. There is recent evidence that such 'updating' of DMN is taking place after a series of learning sessions of a particular tasks, showing a correlation between DMN modulations and the results of learning (Taubert, Lohmann et al. 2011). Even more recent is evidence that after just a single training session, with neurofeedback assisted performance of both simple voluntary gaming tasks and tasks requiring subjects to simulate a future research project, DMN components show results of Hebbian learning, leading the authors to speculate that: "the resting-state patterns may constitute a powerful brain-wide and personalized 'window' into the personal history of brain activations in individual subjects" (Harmelech, Preminger et al. 2013 9496). Per implication, it would also explain the important role of the DMN for narrative simulation.

Needless to say, narrative simulation requires the integrated representation of many different types of information and may range from single distal intentions up to the narrative simulation of the unity of life – the highest level of action as mentioned by Ricoeur (Ricoeur 1992). In such simulations, the agent's self plays an important role. A subset of DMN components appears to be specifically engaged when an agent is representing, monitoring, evaluating and integrating information that is related

⁵²⁷ Another interesting finding is that in chronic pain patients, there appears to be a correlation between their accompanying symptoms like depression and abnormalities in decision-making, and disturbed dynamics of their DMN (Baliki, Geha et al. 2008).

to himself, for example when this information is judged to hold of him as a person. These cortico-midline structures (CMS) are found to be consistently activated in such processing self-related information stripped of contextual information, and is interpreted as being partly responsible for the experience of a stable self, a 'core self' (Northoff and Bermpohl 2004).⁵²⁸ Indeed, particularly when subjects were asked to engage in internally focused and not externally focused self-related simulations, these CMS showed subsequent modulations (Schneider, Bermpohl et al. 2008). We might expect from this that it is important to be able to deactivate this network in case of engagement with externally focused tasks, presented by one's environment. A study with patients with major depression does indeed show this balance to be disturbed. These patients exhibit an increased self-focus and decreased external focus, associated with feelings of hopelessness, apathy and ruminating. Correlated to these symptoms, abnormalities in activations of their (subcortical-)cortical midline structures have been found (Grimm, Ernst et al. 2009). As important as both the default-mode network and its network of cortico-midline structures are for typical simulation tasks and as much as these are involved in updating representations of self and important self-related information, an agent must be able to disconnect or leave out such kludges from the cognitive mechanisms that are invoked when he is required to interact fast and flexibly in his environment.

So given the requirements of updating and evaluating both self-related and contextual information, it is understandable that our expert singer needs a few hours to reflect upon his day of rehearsals. Indeed, there is a lot that he has experienced and learnt during a day in which he had to repeat several times the difficult fast run in Don Giovanni's invitation-aria with a conductor who has a tendency of speeding up the tempo, in which he had to get used to the new stage props and the distances he had to cross singing on the stage, and in which he was again confronted with the stage director's request of behaving like a rapist towards Zerlina. During those resting hours he does what most agents do after an intense day of activities: engage in some mind-wandering along several situations of the past hours, pausing at specific moments and then zooming in on particular elements of a situation or of an interaction or action, or trying to remember what the conductor or another singer has said.⁵²⁹ Some particular content of his thought does attract his attention and invites him to reconsider his

⁵²⁸ Somewhat extended, subcortical-cortico-midline structures are considered responsible for a core-self that is taken to be present not just in humans, nor perhaps only in mammals but in other species as well (Panksepp and Northoff 2009).

⁵²⁹ It has been hypothesized that activation patterns during sleep reflect the replay and reconsolidation of memories related to performances during the day (Pennartz, Uylings et al. 2002). Similarly, during rest periods such reactivation occurs, correlated with learning effects in humans (Daselaar, Porat et al. 2010).

performance or response, which at times he immediately repeats – sometimes silently, sometimes sitting for a moment at the piano – with an eye on modifying or improving it. Fortunately, in most cases he is assured that he must only slightly adjust (the open slots of the templates underlying) the automatisms or schemas, which is generally easy. Other moments require him to engage at different types of processing, of course.

An issue that has been nagging at him and has now again raised doubts, is his decision with regard to the director's request: should he, or should he not act as a rapist, even though he has always tried to avoid aggression in his behavior towards the other sex? How would his decision cohere with his other performances or the statements he has made in interviews or private conversations with regard to gender issues or to the role of opera? For he realizes that his hesitation stems from some immediate yet unarticulated disturbance that he felt when he initially rejected to do so. It would be odd, he now realizes, if he would dismiss the director's suggestion out of hand just because he rejects aggression towards women. For he would of course be one of the first to realize the difference between theatre and reality. But it was only today, when they were also rehearsing the final scenes of the opera, that the director demanded that Don Giovanni was to die not just by the hand of the Commandatore's marble hand, but also by the helping hands of all women that the Don had harassed during the opera – by the hands of Donna Anna, Donna Elvira, Donna Elvira's maid and by the violent hands of Zerlina. So when our expert singer now looks upon the opera as a whole and the fate of his role, he smiles upon the poetic justice eventually wreaked upon him. Satisfied with that outcome – and perhaps also a little bit enticed by the aggression inherent in the role – he decides to accept the stage directions and immediately walks to the piano and starts exercising 'La ci darem la mano' with a somewhat different tone of voice and tempo. Having had already some phantasies of playing the scene with Zerlina with more aggression, some phantasies even disturbing to him, he does not need to search long for an appropriate tone.

What our singer probably will never know, is that the stage director had only recently decided to have the women take part in Don Giovanni's death as he wanted to keep our expert singer with his beautiful voice and convincing playing aboard, knowing that he would not accept to enact a raping scene if it was not compensated by some retributive justice. Together, yet without explicitly discussing it, singer and director contributed to the overall harmony and coherence that should characterize a perfect opera – opera meaning 'works', 'labours' or somewhat loosely: actions.