# How do Narratives and Brains Mutually Influence each other? Taking both the 'Neuroscientific Turn' and the 'Narrative Turn' in Explaining Bio-Political Orders

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Machiel Keestra ( m.keestra@uva.nl )

## Introduction: the neuroscientific turn in political science

The observation that brains and political orders are interdependent is almost trivial.[1] Obviously, political orders require brain processes in order to emerge and to remain in place, as these processes enable action and cognition. Conversely, every since Aristotle coined man as "by nature a political animal" (Aristotle, Pol.: 1252a 3; cf. Eth. Nic.: 1097b 11), this also suggests that the political engagements of this animal has likely consequences for its natural development, including the development of its psychological functions. Given these mutual interdependencies, it is remarkable that only since the 1960s, the more general domain of 'biopolitics' has attracted attention though first particularly in the form of behavioral politics (Alford and Hibbing).[2] Since then biopolitics has gained in interest, so much so that different subdomains can be identified.

Indeed, a 1998 review of the field of biopolitics identified five 'headings' of it: "(1) the case for a 'more biologically oriented political science', (2) 'biologically related' public policy issues, (3) physiological measures of political attitudes and behaviour, (4) the influence of physiological factors on actual political behaviour, and (5) the manner in which our species' evolutionary history has left homo sapiens genetically endowed with certain social and political behavioural tendencies" (Somit and Peterson 43). Striking is how the relation between biology and politics is taken here in a rather unidirectional way, emphasizing particularly the decisive power of biology upon politics. The reverse relation is not mentioned specifically, reflecting the field of biopolitics, perhaps until quite recently.

This absence of studies of political influences on our biology may have to do with the difficulty in investigating such influences. Empirical studies in biopolitics have two foci, broadly speaking: genetics and the brain, both of which have turned out to be complex and dynamic phenomena (Alford and Hibbing). Yet the studies of genetics and brain processes have made much progress in the last few decades, thanks to the development of research instruments - like fMRI brain scanners and TMS brain stimulation instruments - and of computational tools for data analysis and the simulation of explanatory models. For the field of biopolitics it is particularly relevant that within cognitive neuroscience the study of social and political issues has witnessed an increasing interest of researchers even more recently.

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[1] The so-called Macchiavellian hypothesis has been subject to debate since it introduced the need for social expertise as an explanation for the evolution of the primate brain (Byrne and Whiten). Though being modified and specified in several respects, its emphasis on the co-evolution of social interactions with more complex social groups, more advanced cognitive processes and brain growth receives still interdisciplinary support, cf. (McNally, Brown and Jackson).

[2] A first study that reported in 1985 correlations between a political type in Lasswell's sense and a 'neurochemical profile' focused on the serotonine levels of subjects with a higher or lower degree of power seeking . The author admitted that since the effects of serotonine on the brain were still unclear it was difficult to specify the causal pathway involved (Madsen). Such a pathway can meanwhile be explained more in detail, as was done in a study connecting someone's genetically disposed dopamine sensitivity to his/her political liberalism with a mediating role of social relations (Settle et al.; Alford, Funk and Hibbing; Ebstein).

Indeed, aware of the enabling and mediating role of the brain regarding those issues, a truly 'neuroscientific turn' can be observed in the social sciences, testified for example by the emergence of the field of 'neuropolitics' (Connolly; Vandervalk).

Developing a systematic neuropolitics or biopolitics in general is a difficult challenge because of the wealth of causal influences on and interdependencies between biological, brain, cognitive and socio-political factors.[3] Taking a somewhat more abstract perspective, this paper focuses on the process of emerging complexity in adaptive systems, enabling those to conduct ever more complex processes. Yet, parallel to that development can be observed that such systems, or organisms, are also capable in reducing the complexity of the information they are to process. Once they're capable of developing and adjusting such compressed and complex representations of information, those systems or organisms can handle more information faster and more efficient and adaptive, yielding important benefits to the organism in navigating its environment (Halford, Wilson and Phillips).

Before focusing on the role of narrative as a cognitive strategy for such a reduction of informational complexity, I will discuss the development of stable structures and increasing complexity in dynamic systems. Such a more general perspective prepares our discussion of the structures of both narratives and politics and in doing so contributes to the explanation of their interaction.

## The systemic development of increasingly complex structures and representations

It has been observed that there is a tendency in systems that function adaptively in a dynamic environment to develop increasingly hierarchical and complex structures. Whether it concerns organisms, social organizations or artificial 'agents', those systems are more flexible and effective in interacting within their environment that are capable of developing so-called 'intermediate stable forms' (Simon) or 'generative entrenchments' (Wimsatt). In other words, such systems develop a structure in which some components are becoming more stable than others, upon which subsequent structural developments can rely, together facilitating an ever faster and more adaptive interaction with the environment.

For faster and more adaptive is this interaction when some functional components with specified relations between them are already in place, than if each time again the system either performs with a random internal configuration or when it simply retains the overall structure it applied during a particular successful response. Explaining this, Wimsatt uses the metaphor of trying to find a correct number for two number locks: one, in which a partial successful solution is preserved, and another lock that only allows completely separate and novel trials. The first lock is opened much quicker than the second, obviously. In terms of biological organisms, those that are capable in preserving and passing on partially successful solutions will have more reproductive success than those that are not (Wimsatt).[4]

Interestingly, the conservation of such stabilized components does facilitate further developments as these higher level components become reliable stepping stones or ingredients of new components. Even when these stabilized components are in fact 'cobbled together' from already existing ones, the net result is a snowball effect that leads to an

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[3] As a result, there is a causal and theoretical pluralism involved in describing the role of the brain in cognitive and political processes – see for more on this issue my (Keestra "Bounded Mirroring: Joint Action and Group Membership in Political Theory and Cognitive Neuroscience"). Important to note is that when such pluralism obtains, each separate theory has only a limited 'relative significance' for the explanation of a phenomenon, cf. (Beatty).

[4] This example is similar to the example that Dawkins uses in arguing for a healthy conservatism in evolutionary processes (Dawkins).

increasingly hierarchical structure (Clark). Such a snowball effect can be observed empirically in existing systems and be simulated in computational studies as well. With regard to the present context, it is relevant to consider the emergence of increasing complexity both in brain processes as in the representations of information as they are processed by the brain.

As is well known, brain processes are in fact carried out by very large numbers of interacting neurons that together process incoming and internal information, giving rise to cognitive and behavioral responses. These responses change over time, as developmental studies in animals and humans alike show an increasing speed, flexibility and efficacy in a wide range of tasks. According to the so-called 'neuro-constructivist' theory of development and learning, these developments are best explained by assuming that the brain develops an increasingly hierarchical structure including newly developed functional modules (Karmiloff-Smith; Mareschal et al.). Such an emerging complex structure has meanwhile been demonstrated by several lines of evidence, including computational studies that provide a novel type of support in addition to empirical studies (Meunier, Lambiotte and Bullmore).[5]

In parallel with the development of increasingly complex structures in the brain, both animals and humans demonstrate that growing expertise is associated with their developing increasingly complex representations of the information that is involved in their expertise. That is, the knowledge structures that are processed in their brains during relevant tasks show also an increasingly hierarchical and modular structure.[6] Well known components of such complex representations are the so-called chunks of information that experts develop, in which after repetitive use some co-occurring units of information are recoded by grouping them together as a single unit, thus compressing the initial amount of information considerably. With this, an expert is capable of processing much more information at a time than a novice is (Miller). Such chunking of information has been studied exhaustively in chess players, with chess masters being able to develop a memory store of up to 50.000 different positions thanks to this chunking process (Gobet and Simon).[7] Such information compression is a phenomenon that can be observed both in cognitive and in behavioral studies of expertise and which has important consequences.

By compressing the amount of information to be processed, the brain must devote less cognitive resources to this process, which opens up the possibility of next making the task even more complex or performing another task in parallel. This can be observed in fMRI studies of expertise, which show two distinct phases during learning: first, a phase of increasing efficiency and decreasing neural processing, second, a phase in which additional activations can occur as a result of engaging other neural and cognitive processes (Petersen et al.). Indeed, these two phases themselves are taken to constitute the increasing complexity of the brain processes that are involved in handling increasingly complex representations (Guida et al.). In *Figure II* below - taken from (Keestra *Sculpting the Space of Actions. Explaining Human Action by Integrating Intentions and Mechanisms*) - an abstract representation of this process of skill learning or increasing expertise can be seen. It shows the parallel and corresponding developments of a – relatively simple – modular structure in the explanatory

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[5] The term 'complexity' is in fact not easy to define. A usefull definition is that of the number of elements and of the – types of – relations between those elements (Halford, Wilson and Phillips).

[6] The reality of hierarchical representations and processes in the brain has been contested, some authors claiming that hierarchical models are mere conceptual constructs. Reviewing several lines of evidence for such models, Cohen maintains that such hierarchical models do have a robuts reality (Cohen). This concurs with our arguments about the systemic tendency to develop a hierarchical structure.

[7] Studies with chess players have led to the development of the 'template' theory, which involves an even more complex, hierarchical structure in the relevant knowledge structure. A template may involve several chunks and yet leave several open slots, which allow for a greater flexibility in handling minor variations (Gobet and Simon).

mechanism that is responsible for processing musical information and the increasing complexity of the representations that are being processed.

With the possibility of such developments affecting both the neural mechanisms that underly cognitive processes and the representations involved in these, humans possess a much greater capability of flexibly interacting with their environment and even transforming it. Narratives play an important role in such interactions and transformations, particularly as they offer action representations that enable the organization and coordination of intra-individual and inter-individual actions.


## Narrative, complexity reduction and the organization of actions

The more complex representations an agent is capable to use, the more flexible he (or she) is in navigating his environment and in organizing his own operations, as representations play a crucial role in such navigation and organization. This is particularly relevant with respect to his actions, as these often require careful organization and coordination over time and with other agents. If only for avoiding counterproductive actions or failing joint actions agents need to develop and share complex, hierarchical representations, in other words: become 'planning agents' (Bratman). Particularly, for planning actions in the future they must employ such representations for a "dramatic rehearsal (in imagination) of various competing possible lines of action" (Bratman 150, quoting Dewey).

A particular form of representation that human agents use among other things for such imaginative organization and coordination of their actions is narrative. Indeed, as early as in Aristotle's Poetics, the focus of a story or 'mythos' is considered to be human action: "the plot is the imitation of action" (Poet. 1450 a 3). Ricoeur has elaborated this notion in his extensive treatment of narrative as a medium in which agents can configure and refigure actions (Ricoeur *Time and Narrative (Vols. 1-3)*). Narrative is further specified by Ricoeur as containing a '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 *Time and Narrative. (Volume 1) ix*). With that, narrative is fulfilling an important role as a particular type of representation that reduces informational complexity involved in individual and joint action. Such reduction is made possible also by narrative's offering the resources to develop configurations at several hierarchical levels of complexity (Ricoeur *Oneself as Another*). Importantly, with the help of such hierarchically structured, verbal representations of action, agents can improve their action performance, teach and learn from others, engage in joint actions with others, and so forth.[8]

Not surprising in light of this emphasis on the function and relevance of narrative, is the fact that in recent times a 'narrative turn' has been observed in several disciplines, including the cognitive sciences. In that context, narrative is studied as a 'tool for thinking' (Herman). Narrative can play this role as a tool for thinking since it offers a medium for the configuration of representations that exerts in turn a top-down influence on the neural mechanisms responsible for our cognitive and behavioral responses. Narrative offers agents the possibility to 'simulate' an action, simulation being "the re-enactment of perceptual, motor and introspective states acquired during experience with the world, body and mind" (Barsalou 1281). Important to note is the fact that such simulation of an action – or any other

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[8] For more evidence and details, see particularly Part II of my (Keestra *Sculpting the Space of Actions. Explaining Human Action by Integrating Intentions and Mechanisms*) in which a wide range of empirical materials is being discussed that demonstrate an interaction between the – implicit – employment of hierarchically structured action representations and the capability of making these representations explicitly available, for example for deliberate practice of a skill.

state – does not consist of the reactivation of a complete and faithful rendering of a previously experienced state. On the contrary, a narrative simulation is always constructive in nature, building upon multiple kinds of memorized features yet integrating these in configurations that may contain novel elements and relations. For that reason, such processes have also been referred to as 'constructive episodic simulation' processes (Schacter and Addis).

With its constructive nature, conducive to reducing and structuring the complexity of action representations, narrative simulation contributes to the agents' development, coordination, preparation, performance and evaluation of both their individual and their joint actions.


## Biopolitics and taking the Neuroscientific and Narrative Turns.

Let us now focus on narrative by taking up the question, what influence can a specific socio-political order have on our biology, particularly on our brain and cognitive processes? Here, I will answer this by discussing evidence that differences in cultural or socio-political narratives do correspond with particular neural correlates. The peculiar way in which distinct narratives represent relations between elements and those elements themselves can have a lasting effect on the brain and cognitive processes involved. This fact makes cultural neuroscience an important, though somewhat belated development in the rich field of cognitive neuroscience.

Neuroscientists have begun to integrate insights from anthropology and religion studies in their experiments, comparing the responses and brain activations patterns in groups of subjects from different cultures and religions or in bi-cultural subjects. A number of studies has taken up the distinction between cultures that promote independence – or individualism – and those that promote interdependence – or collectivism.[9] Such cultural differences are transmitted through distinct practices and narratives, entailing different configurations of the relations between an individual and his social context and different interpretations of what it is to be an individual and what social contexts – family, peers, professional context, etcetera – can mean to the individual. Among other things, narratives help to structure and reduce the complexity of these configurations and simultaneously to transmit them, even if they are inevitably also being transfigured or changed along the way (Ricoeur *Time and Narrative (Vols. 1-3)*).

It has been observed that, for example, cultural differences in the relation to one's mother versus self-related processing can be observed when comparing western to east asian students. The fact that east asian students tend to show more overlap in their brain activations and their responses between the two conditions is probably due to the stronger interdependence with the mother in those cultures (Zhu et al.). Intriguingly, there is evidence that such cultural differences can be detected even in perceptual processes that have been long considered to be immune against such influences, with American subjects being more sensitive to changes in focal objects and east asians subjects more to changes in the context (Masuda and Nisbett).[10] Processing complex information does usually invite a form of

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[9] The sharp distinction between cultural individualism and collectivism has been contested, with some authors arguing for a graded continuum between those. Not only societies but also individuals can differ and change along that continuum, according to some authors. Others point out that still it is likely that individuals can at times also employ a different type of attitude or behavior (Killen and Wainryb). Notwithstanding such reservations, the distinction is still considered to be empirically plausible.
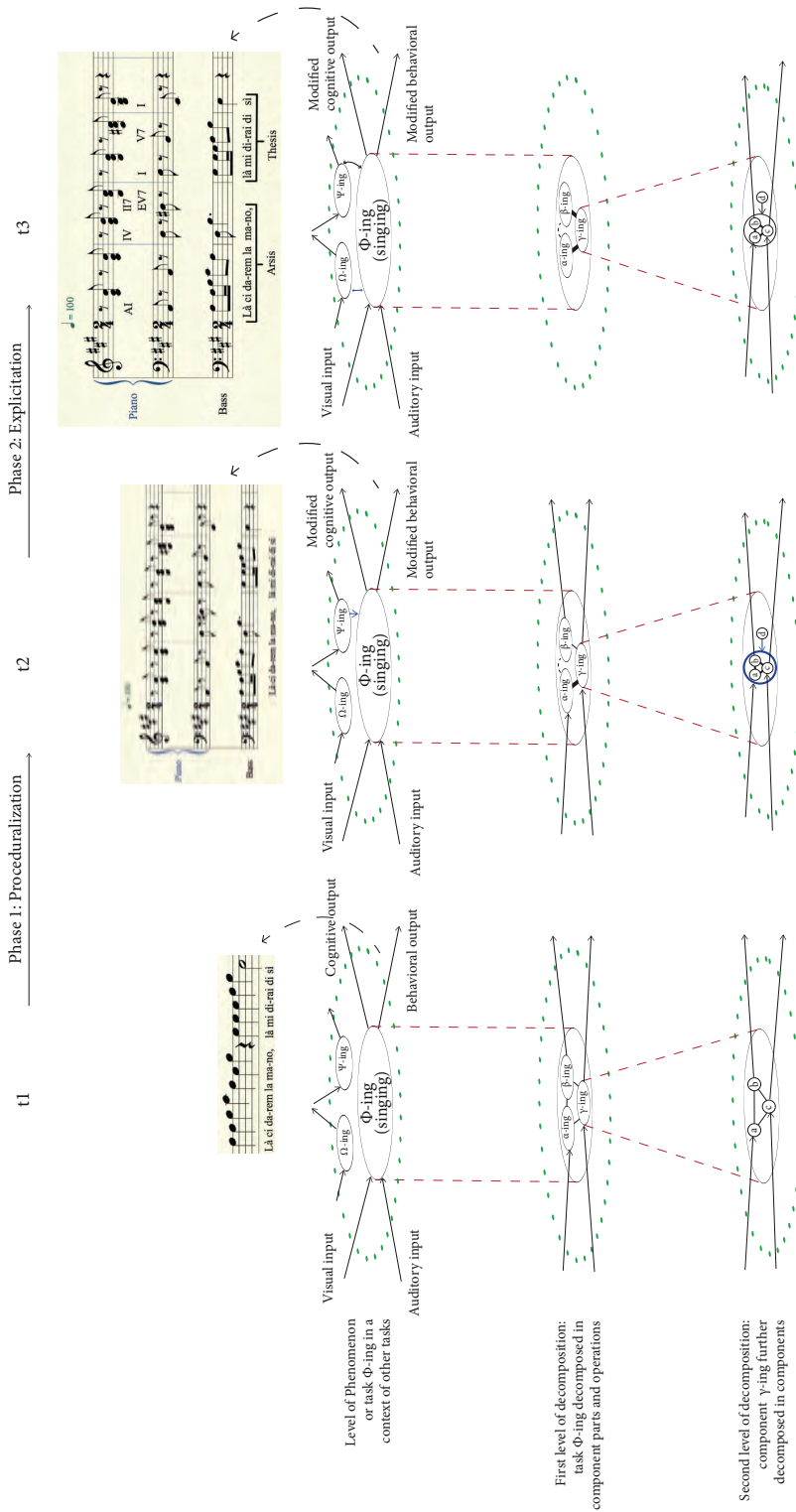
[10] Pertinent to a Dutch context are the results of studies that suggest that even differences between christian denominations – like catholicism or calvinism - leave their trace on several processes, including perception, attention allocation and decision making (Colzato, van den Wildenberg and Hommel; Hommel et al.).

complexity reduction, yet the configurations that are used for this reduction can differ between  societies, or between historical periods for that matter.

Cultural neuroscience research presents ever more evidence of functional and even structural changes in brain and cognitive processes as a result of cultural differences, as several reviews show (Chiao et al.; Han and Northoff; Henrich, Heine and Norenzayan; Park and Huang). In the present context of biopolitics, this implies that a 'biologically oriented political science' must also take into account the influence of socio-political structures and their narratives on brain processes. That is, we have to take both the neuroscientific and the narrative turn simultaneously and should not assume that the two are incompatible with each other, forcing researchers to choose between the two. There are mutual influences between the reduction of informational complexity that cognitive processes strive for and the function that socio-political narratives exert as a 'cognitive tool' in this context.[11]

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[11] More generally, narratives can be analyzed with regard to their completeness or coherence, for example. Research shows that the use of specific indicators in their narratives by subjects can be correlated with particular conditions of their brain and cognitive processing (Boelen et al.; Cannizzaro and Coelho; Le et al.). Such a specific focus on narrative in empirical and experimental cognitive neuroscientific studies is a recent and welcome development.

**Figure II. Representation of an explanatory mechanism involved in development or learning as accounted for by neuroconstructivist theories, as discussed in Part II**

Phase 1: Proceduralization    Phase 2: Explicitation

t1    t2    t3

Visual input

Auditory input

Cognitive output

Behavioral output

Modified cognitive output

Modified behavioral output

Ω-ing    Ψ-ing

Φ-ing (singing)

Level of Phenomenon or task Φ-ing in a context of other tasks

First level of decomposition: task Φ-ing decomposed in component parts and operations

α-ing    β-ing    γ-ing

Second level of decomposition: component γ-ing further decomposed in components

Simplified representations of the explanatory mechanism responsible for the task Φ-ing, in this case: singing. According to the neuroconstructivist theories of development and learning discussed in chapter II.2, two (partly overlapping) phases of learning can be distinguished. Mechanism modifications are involved in this (see figure I). The first phase of proceduralization is characterized by improved performance of Φ-ing, enabled by the modularization (blue circle) of some mechanism (sub-)components which enables their faster and stable processing, enabling increased (bold) and decreased (dotted) interactions between components at another level. This also facilitates additional interaction (blue) between tasks Φ-ing and Ψ-ing (e.g. acting). The second phase of explicitation is then characterized by increasing explicit control of Φ-ing, again facilitated by additional interactions (blue) between tasks. Due to representational redescriptions, multiple representations involved in the task (curved dotted arrows) are available to the agent, leading from an implicit and simple representation to more complex, hierarchically structured and explicit representations of the music piece. Note that vertical red dotted lines represent constitutive relations between mechanism levels and that green dotted circles represent the context within which components figure.

***Figure II. Simplified representation of the explanatory mechanism responsible for the task Φ-ing – here singing - and the representation of employed musical information.*** According to neuroconstructivist theories of development and learning, two (partly overlapping) phases of learning can be distinguished. The first phase of proceduralization is characterized by improved performance of Φ-ing, enabled by the modularization (blue circle) of some mechanism (sub-)components which enables their faster and stable processing, enabling increased (bold) and decreased (dotted) interactions between components at another level. This also facilitates additional interaction (blue) between tasks Φ-ing and Ψ-ing (e.g. acting). The second phase of explicitation is then characterized by increasing explicit control of Φ-ing, again facilitated by additional interactions (blue) between tasks. Due to representational redescriptions, multiple representations involved in the task (curved dotted arrows) are available to the agent, leading from implicit to more complex and explicit representations of the music score. Note that vertical red dotted lines represent constitutive relations between mechanism levels and that green dotted circles represent the context within which components figure. (Figure reproduced from (Keestra *Sculpting the Space of Actions. Explaining Human Action by Integrating Intentions and Mechanisms*).)

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