Morphology and Morphogenesis of Folktales and Myths

Pierre Maranda
Department of Anthropology
Université Laval
Québec, Canada
pmaranda@videotron.ca

ABSTRACT

This paper draws on a set of previous ones that I develop below. It consists of three parts. Part One begins with (1.1) a prolegomenon on trust, the result of an implicit calculus of transition probabilities, followed by (1.2) a summary consideration of the dynamics of memory and imagination. Part Two deals with analytic units in the processing of folk narratives. Part Three bears on morphology and morphogenesis and presents DiscAn, a computer system that may generate dynamic cognitive maps as a morphogenetic approach..

1. PART ONE

1.1 Prolegomenon: Trust and *p*

First, a trivial but nonetheless basic statement: Trust is the foundation of all productive human relations. It underlies necessarily friendship, exchange, reciprocity. Societies collapse when trust breaks down. Trust in their parents is a given without which children cannot evolve as adept family - and consequently society - members. Trust is slowly built between people that become friends. It is often a long process of trials and sometimes errors, an empirical, pragmatic test of the extent to which one may share one's deepest feelings, thoughts, concerns with another person without fearing reticence, judgment or betrayal. Trust lies at the root of harmonious communal life. In Lévi-Strauss' words, trade or war are the basic vectors that structure relationships between societies. But there is no trade without trust. And, I repeat, trust can emerge and be consolidated only through experience, i.e., both linguistic and extra-linguistic pragmatics.

Be it one's trust in one's older sibling, in one's school teacher or in one's banker or investment broker, one builds it gradually through a subliminal statistical process geared to insuring stability and safety. Actually self-amplifying loops consolidate both trust and distrust (cf. Bayesian Decision Theory - the Bayesian models

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of probabilistic coherence and probabilistic inference rules that regulate the levels of confidence and surprise, doubt or disconcertment [22, 31, 33, 52]). What I have called "nets of expectancies of events" [31] provides the basis for an intuitive probability coefficient that affects the degree of plausibility of beliefs. Here, "events" must be understood as being intellectual, pragmatic, emotional, whatever may impinge on the life of a human being. For example, the contemplation by a person of different scripts of eventual decisions and his or her musing ("data mining") about their bearings, rest on scanning expectancies to which are implicitly or explicitly assigned degrees of likelihood and acceptability in given contexts. And different scenarios can be generated by varying purposefully plausible contexts, an operation that will affect expectancies differentially. As I said, that information processing proceeds from past personal knowledge (based on experience) or knowledge acquired from external sources, and it will affect expectancies differentially - and consequently, decisions and other forms of behavior as well. Such mental operations are not alien to some sort of subliminal factor analyses and such statistics as multiple regression where *Y* varies according to the *Y*s taken as inputs, the *X*s being akin to Memory Organization packages (MOps), Memory Organization Processes (MOPs), and Memory Organization Nets (MONs) whereas the *Y*s to ISPs - Imagination Structuring Processes (more on that below).

This is akin to the domain of probabilistic semantic grammars and is more or less systematic practice in some psychographic research and in the strategies of advertising. It is also commonly seen in current verbal interactions. For example, Person A will avoid talking about a given subject to Person B in a given context apprehending that Person B's thought processes might take a turn unattractive to A and lead B to ask specific questions that would increase B's knowledge to the detriment of A. Conversely, A may decide to talk about a given subject so that B will most likely ask specific questions and so that that A will be in a position to alter B's knowledge by his answers. In such cases, the psychographer, the ad-man or Person A all presume to have a relatively adequate knowledge of their targets' appetencies and of the action to be taken to manipulate them. Along the same lines a writer moves on the thin line between what he considers to be a bold statement and what he thinks his readership will accept -- as pointed out by T.S. Eliot in *Notes Towards the Definition of Culture* (chapter "Tradition and the Individual Talent").

1.2 Memory and Imagination

I take the tack that the basic components of cultural universes consist of MOps and ISPs. I have defined those concepts in previous publications [27, 31, 34) of which I rephrase some passages.

1.2.1 Memory

I have suggested that Schank's definition of Memory Organization Packages (MOPs) be renamed hereafter "MOps", because I use MOPs to mean Memory Organization Processes. MOps [25-28, 31, 36, 47-49] should be improved on three scores. Actually the concept of MOps aims at identifying clusters of meanings stored in memory and stemming from personal experiences rather than semantic categories. As such it is context-dependent. As a matter of fact the term MOp re-labels what Hebb called "cell assemblies" in his classic theory of memory (more on that below). MOps constitute sorts of personal vital databases, accretions of past experiences, some of which remain deeply buried in the subconscious, others more or less easily - and more or less serenely - retrieved, or surging in triggering contexts (Marcel Proust's novels masterfully provide and analyze examples of that kind of MOps spurts). Such "packages" are related to what Lévi-Strauss calls "bundles of relations" [19, see Ch. XI and his voluminous *Mythologiques*]. But the MOps approach must be taken three steps further.

(1) To the notion of "packages" should be added that of "processes", MOPs, to better take into account memory dynamics. MOps would remain as paradigmatic units with limited potency, akin to "slots" in Frame Theory [38] whereas MOPs are associative structures that connect clusters of MOps with comput-able probabilities.

(2) The notion of "Memory Organization Nets" (MONs) develops in turn that of "processes" - MOPs by adding to it a coefficient of "appetencies". MONs denote that MOPs do not stand alone but are linked, on that level also with computable transition probabilities, in more or less coherent clusters through appetencies (and thus are of another order than Schank's and other models of graphs of conceptual dependency). "Appetency", a term proposed by Harary in Digraph Theory and developed by Kamp and Hasler [11], means an empirically grounded -- i.e., pragmatic – tendency for an image or concept to "have an appetite for", to attract, or to be attracted by other images or concepts in its gravitational orbit. The concepts of "attractor" and "attraction basins" that I will define below develop and implement *appetency theory* [11, 34, 37] and *resonance theory* [36]. MONs would also take into account, and be related to, "scripts" stored in memory, an example of which is my representation of Proppian functions (Figure 1, below).

(3) Associations between semantically high-loaded terms repeated from generation to generation – like, indeed, between neurones according to *Hebbian learning* – consolidate their directed linkages, i.e., appetencies (for example, mussels and French-fries for Belgians or burka and women for some Muslims, etc.). Some associations have put on so much semantic weight – so much potency – that they eventually acquire a stereotypical force with robust identity functions that "are gut-wrenching". Such appetencies generate "isosemies", that is, ways of giving the same connotations to both terms and behaviors. They polarise either consent and approval, or rejections which can lead to ostracism, even conflicts[1]. Representations and cognitive mappings find in this approach semantic resonances (*Category ART – Adaptive Resonance Theory*; [13, 30, 33, 36, 56-57]) that work in loops and cycles in accordance with the exercise of our memory, our imagination, our mind.

1.2.2 Imagination

Imagination should be considered a significant vector in that approach because MOPs and MONs present only a limited and partial view of mental processes. Indeed, MOPs provide basic data on which imagination works at the same time as it – imagination – feeds-back on those processes for revising MONs to reconfigure them. We must therefore take into account what I call "Imagination Structuring Processes" (ISPs) when investigating how the mind works, both on the personal and cultural planes. Actually, both memory and imagination pertain to "social facts" in that they depend on representation systems, the elements of which have been differentially internalized by the members of a society. In Strecker, Meyer and Tyler's words about Rhetoric Culture [51, see p. 8 – emphasis added], "Rhetoric culture […] seeks to give an accounting of the *imaginative resources that ground our approximations and make our openings and closings*."

The management of MOps is relatively selective. Depending on MOPs reorganized through MONs, i.e. MONs → MOPs → MOps -, some MOps are sent right away to the mental trash can – "Forget it!" - "I don't want to be remembered of that!" But some MOps are relatively un-erasable: they keep haunting personal or collective memories, e.g., the death of one's parent, that of a dear friend, McCarthyism in the USA, September 11 2001, etc. The Propp net shows MONs, and the itinerary between nodes depends on the teller's ISPs. Only a very competent teller will be able to navigate through sequencing the less probable nodes and still build a convincing story.

A summary legend to Figure 1: capital letters refer to broad categories of actions, viz., Propp's "functions". In the network, lower case letters and numerical subscripts stand for more specific functions (subsets of the major ones; for a full description and analysis see Maranda [25, 29, 33].

Transition probabilities from one node to another figure at the arrow heads (1st-order Markov chains):

A = lack or mischief of some sort

B = plan to counter lack/mischief

C = start of counteraction

F = acquisition of magical agent by hero

[1] Some of these appetencies remain unidirectional ("unilateral" in terms of oriented graphs). For example, for cultures where we can find the metaphor "this woman is an angel", "woman" is in appetence of "angelic character". But this metaphor is not reversible to "this angel is a woman". It is therefore a unilateral appetence of "woman" to "angel". A bidirectional appetence ("bidirectional" in terms of oriented graphs), however, is reciprocal, as in the reversible metaphor "youth is the morning of life" compared to "the day is still young".

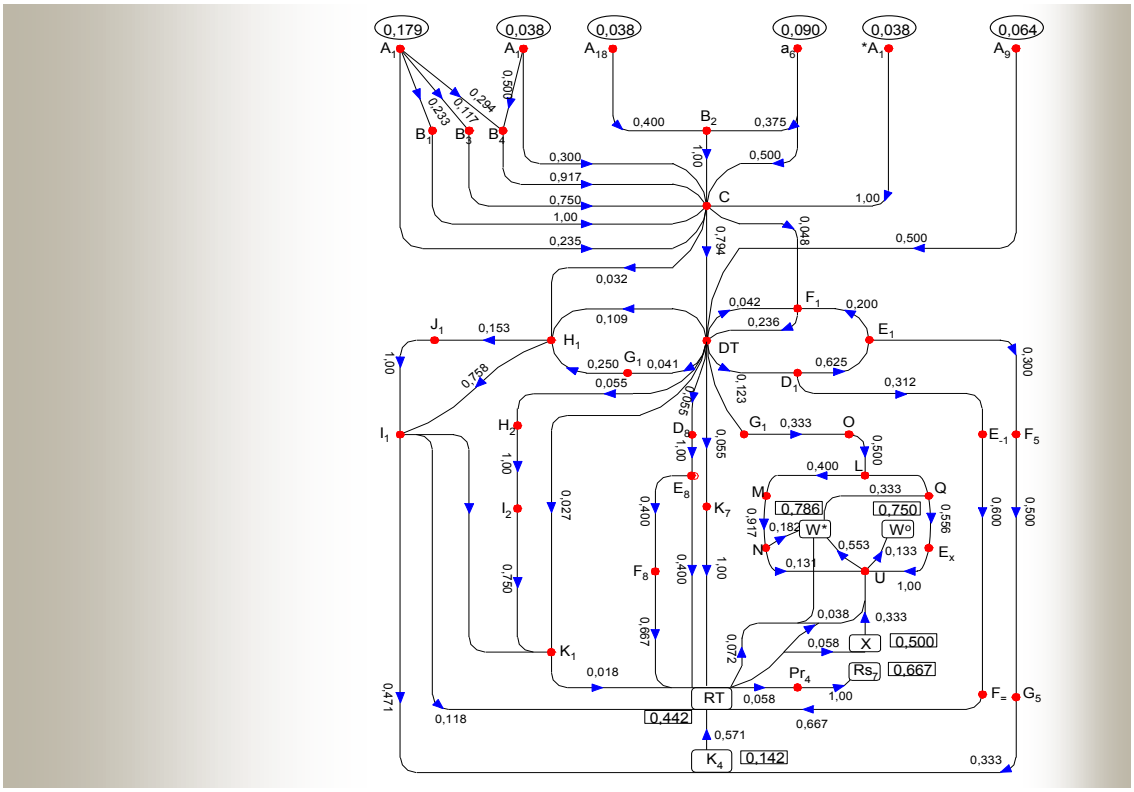

Figure 1. A probabilistic and reticular representation of Propp's algebraic morphology of the folktale[2]

DT = hero departs on mission

H = hero fights villain

J = victory of hero over villain

K = lack liquidated

N = completion of difficult task

RT = return of hero

W* = wedding and accession to the throne

Note that C acts as a condensation node and DT as a diffraction one. A skilled teller will know how to navigate along more or less expected paths to bring his story to an expected or surprising end. An unskilled one will take a direct line to RT and come up with a simple-minded plot the close of which will leave his audience disgruntled.

Each Proppian "function" is actually a culturally pre-stressed Memory Organization Package (MOp) - a sort of *Völkergedank* (Bastian's concept, see below), and the performance of a teller along the Russian fairytale generative network depends on his Imagination Structuring Processes (ISPs).

To sum up, ISPs are based on MOPs and MONs and they review (or even revise) them retrospectively, use them when scanning plausible eventualities before making a decision, or when inventing compensatory and many other kinds of scripts. The arrays of representations MONs make available to their carriers hang together in more or less loose clusters. Through ISPs MOPS can be disconnected and reconnected: the meanings of their constituents can be revamped through creative processes such as metaphors, a prominent Imagination Structuring Process [5, 22-23, 32, 35]. These ISPs are function of pragmatics, hence of percepts and connotations as well as denotations:

((((MOps)*((MOPs))*(MONs)))*(ISPs))).

Now, can those concepts help in the analysis of narratives? I give a positive answer to that question: they can be useful if we operationalize them as "attractors" and "attraction basins". But before that, a brief discussion of analytic units used in narrative research will be appropriate. (Propp [43, p. 176] insisted on the importance

[2] Cf. [7] on Propp's algebraic model.

of situating any folktale in the social context "where it lives". And since action/experience impinges heavily on both memory and imagination, pragmatics comes into play to load MOPs and ISPs with more or less heavy connotations.)

2. PART TWO: ANALYTIC UNITS

2.1 A Summary Review of Analytic Units

Obviously, the accuracy and validity of script analyses depend on the operationality of analytical units. Here a summary review of some such units may be pertinent (see also Darányi's paper in this volume).

We may begin with Adolf Bastian, a foremost ethnographer who did exemplary field work in exotic societies in the 19th century and who founded the Berlin Anthropological Society in 1869. In his books, among them in *Das Beständige in den Menschenrassen und die Spielweite ihrer Veränderlichkeit* [1], he proposed the concepts of *Elementargedanken* ('elementary thoughts') that find their expression as *Völkergedanken* ('ethnic ideas' or 'folk ideas'). Their inventories would describe the basic components of different cultures' worldviews. Such folk ideas include fables, legends, myths, proverbs, sayings, tales, etc.

A few years later, in 1873 Veselovskij [54] used motifs and themes as analytic units. In Propp's words [42, see p. 12]: "Veselovskij means by themes a complex of motifs. 'A theme is a series of motifs. A motif develops into a theme', and 'By theme I mean a subject in which various situations, that is, motifs, move in and out'". Propp [op. cit. p. 13] then discusses Bédier's analytic unit, viz., "elements". As for Aarne's index , it introduces the term "type" to supersede "themes". In keeping with Aarne's terminology, Stith Thompson resorted to motifs in his *Motif Index* and, after Aarne, to types in *The Types of the Folktales*. It is needless to recall here Propp's sharp criticism of the motif, theme, element and type as operational units because of the lack of precision of those terms [42, see Ch. I]. He proposed to use instead the concept of "function": "Function is understood as an act of a character, defined from the point of view of its significance for the course of the action [42, p. 21], i.e., a function is a syntagmatic vector: "Functions constitute the fundamental compon-ent of a tale." He also introduces larger analytical units, namely "spheres of action" [op. cit. p.79] and "moves" [op. cit. p. 92].

On the other hand, in linguistics C.F. Hockett [9] proposed a connectionist "Resonance Theory of Morphology". It implies "recognition units", that postulate what I call a MON (Memory Organization Net). Such recognition units consist of clusters of meaning recognition (cf. "attraction basins" below). Of different sizes, they trigger reverberations in internalized systems in a way somewhat germane to Category Adaptive Resonance Theory.

And more recently, let's return to folkloristics with automated motif identification in folklore text corpora [55, p. 126]. The authors state:

> "We note in passing that the concept of a motif goes back to classics of folklore and literary analysis (see the summary by Würzbach 1998)**.** In our interpretation, a motif is a second-level aggregate of some first-level content criteria, e.g. the motif "Unpromising hero" (see Meletinsky 1958) is a compilation of 'hero', 'son', 'youngest', and the like. In other words, a motif is a broad concept related to those narrower terms which define it.
>
> In library and information science however, it is an established practice to express such broader concepts from more detailed content criteria by automated classification, for example by singular value decomposition (SVD) (Deerwester *et al*. 1990), so that, as a prelude to information retrieval, the results can be used for an advanced type of indexing called latent semantic indexing (LSI) (Lochbaum & Streeter 1989). In short, we wanted to apply LSI in the domain of folklore."

More recently Jean Petitot, in his remarkable paper on Lévi-Strauss's canonical formula for the analysis of myths [41, p. 272], discusses analytical units as follows:

> "(i) *terms*, at the *syntagmatic* level, that is, *actants* in the sense of an actantial syntax (to be distinguished from actors or characters that usually syncretize several actants and support thematic roles),
>
> (ii) semantic *functions*, at the *paradigmatic* level, that depend on codes (in Lévi-Strauss' sense) belonging to deep structures: they are values categorizing the continuous substratum of paradigms into discrete units. […]
>
> The problem, which is an extremely difficult one, lies in holding together the paradigmatic (semantic "codes") and the syntagmatic (actantial interactions) levels. A basic thesis of semio-narrative structuralism is that paradigmatic semantic relations can only be implemented through actantial syntagmatics. Semantic values are "confined", "invested" in the actants and circulate through their interactions.
>
> Three theoreticians have played a crucial role in elucidating these relationships: V. Propp, C. Lévi-Strauss and A.J. Greimas[3]. With his grammar of functions, Propp overly dissociated the narratively dominant actantial syntax from the semantic content. All too often he reduced the latter to simple thematic roles. On the other hand, *by focusing dually on the paradigmatic axis and its projection on the syntagmatic axis, Claude Lévi-Strauss somewhat underestimated the problem of actantial syntax. The synthesis was achieved by Greimassian theory which showed in detail how actantial syntax could handle logico-combinatorial operations on paradigmatic value* [emphasis added]."

But when it comes down to actual analyses of folk narratives, does Greimassian theory really help in defining operational units? In that respect we may want to consider Lévi-Strauss' concept of "mythemes" [19, p. 232.; 21, pp. 168-172]. As culturally pre-stressed components of myths, they are "pregnant" (in René Thom's [53] terminology) in that they contain the seeds of syntagmatic dynamics that will configure narrative structures. This analytic unit might have marked the switch from morphology to morphogenesis but Lévi-Strauss' concept does not meet the requirements specified by Propp, after Veselovskij, viz,

[3]These works are masterpieces of structural epistemology and methodology beginning with the works of Saussure, the Prague Circle, of Husserl's third *Logical Investigation*, Jakobson, Hjelmslev and Brøndal.

that it must be an indivisible narrative unit [42, p. 12]. Mythemes take indeed the form of elementary propositions. Lévi-Strauss wrote [19, p. 233] that his method consists of "breaking down its [a myth's] story into the shortest possible *sentences* [emphasis added]. Thus: "a function is, at a given time, linked to a given subject. Or, to put it otherwise, each gross constituent unit will consist of a *relation.*" And […] "The true constituent units of a myth are not the isolated relations but *bundles of such relations* (cf. MONs) and it is only as bundles that these relations can be put to use and combined so as to produce a meaning". As for "gross constituent units", Darányi (this volume) writes "Related research on the canonical formula of myth (…) shows that at least 256 classes (subspaces) [cf. 45] can be filtered out based on canonical variables and value configurations leading to group symmetries and symmetry breaking (…). Such symmetries constitute phases in Markov chain based patterns (…)."

As an attempt to tackle, in Petitot's words, the "extremely difficult" problem that "lies in holding together the paradigmatic (semantic 'codes') and the syntagmatic (actantial interactions) levels" I will now introduce the notion of attractor and attraction basins as units my team and I use in our analyses of "mentifacts" [12, see Ch. 1].

2.2 Attractors and Attraction Basins

I have written in connection with the structuring of www.oceanie.org [34, English translation in print] as follows:

> "Positioning ourselves beyond linearity we address social facts not as coherent and well articulated structures, but rather as semiospheres [6, 16, 17][4], i.e., as constellations of representations and actions. Relations reverberating onto one another structure the universe of meaning which gives to those sharing it the impression of understanding each other when they communicate[5]. We operationalise the concept of semiosphere by using those of attractors and attraction basins. The latter spread and radiate around the former, "words full of meaning" that "are gut-wrenching", as Oceanians tell us, to whom www.oceanie.org provides a partial overview of their socio-cosmic universe.[6]
>
> Each society and each culture has a repertoire of words full of meaning (*Völkergedanken*) or "carrier categories" [15] which configure them and which they configure through feedback, like women, men, gods, work, sex, etc. The semiotician François Rastier spots about 350 of them in industrial cultures [45][7]. The concepts of attractor and basin can be related to "semantic field of keywords" as in [55].

I will now quote Ott's [39] mathematical definition of "attractor" and "attraction basin" (I have slightly modified the syntax of the first sentence):

> Roughly speaking, an *attractor* of a *dynamical system* is a subset of the state space to which tend, as time increases, orbits originating from typical initial conditions. It is very common for dynamical systems to have more than one attractor. For each such attractor, its *basin of attraction* is the set of initial conditions leading to long-time behavior that approaches that attractor. Thus the qualitative behavior of the long-time motion of a given system can be fundamentally different depending on which basin of attraction the initial condition lies in (e.g., attractors can correspond to *periodic*, *quasiperiodic* or *chaotic* behaviors of different types). Regarding a basin of attraction as a region in the state space, it has been found that the basic topological structure of such regions can vary greatly from system to system.

And, because we have not derived our concept of attractor from Chaos Theory but from the neurosciences, it is pertinent to quote Petitot [41, p. 274]: "Such models where the categorization of a continuous substratum space into sub-domains (values defined by *reciprocal determination* [emphasis added]) is generated by a family of generating potentials, have become widespread in contemporary cognitive sciences. If the categorization process is implemented in a network of formal neurons, the generating potentials become true potentials in the physical sense of the term, i.e., "energy" functions whose minima[8] determine the terms of the categorization."

As for our inspiration by neurosciences [11, 37], I have written elsewhere the following [34 - English version in print].

Developments of the law of Hebb [8] on cellular assemblies opened new research horizons on which artificial intelligence still draws and which motivated our approach to the construction of our notions of "attractors" and of "attraction basins". "A cellular assembly consists of a group of cells connected in a reverberation circuit that is a complex and interconnected loop. When an external trigger excites the cells of the loop, they are mutually excited and the whole circuit goes into reverberation" [2]. For the neuropsychologist Donald Oldings Hebb, the strength of connections (synapses) between the neurons can vary

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[4] The semotician Jacques Fontanille [6, p. 296] summarizes Lotman's [16, 17] concept of semiosphere as follows: "The semiosphere is the domain in which the subjects of a culture experience meaning. The semiotic experience in the semiosphere precedes, according to Lotman, the production of speech, because it is one of its conditions. A semiosphere is primarily the domain that allows a culture to define and position itself so as to be able to interact with other cultures ". See also the socio-cosmic approach of the *Erasme* group [3].

[5] The feeling of mutual understanding between speakers requires their semiospheres to overlap, whether they are consonant (for example, political correctness) or dissonant. Hence the recourse to the Theory of Resonance and that of circuits of reverberation which, depending on the degree of sharing of sub-semiospheres, generate friendly communities, more or less closed groups or ghettoes (consonances) and also antagonisms (dissonances) [30, 33, 34, 57].

[6] Stimulated or at least intrigued by our graphs, they use them as sources of inspiration for writings in which they reactivate their cultural roots.

[7] See also [44].

[8] In physics, to minimize energy is the basic variational principle.

diachronically. The synergistic activity of an emitting neuron (pre-synaptic) and of a receiving neuron (post-synaptic) produces a strengthening of the synaptic connection that is designated by the term *Hebbian learning*. Furthermore, the inertia of one of the two neurons causes a weakening of the connection. Hebbian learning also applies to large groups of neurons in the whole of which loops are formed. If a neuron *A* excites a neuron *B* which, in turn, excites a neuron *C* which returns to *A*, then the synapses that connect these neurons become stronger and increase the probability of reiterations of this loop. This positive feedback reinforces the self-stabilisation of neural networks [10, 11, 40].
In terms of representations, this " looping " (or " cycles " in Graph Theory) consolidates the associations of ideas, behaviours and strategies tested in the context of pragmatics [31], such as "empirical deductions" that Lévi-Strauss noticed in the structuring of cultural universes [20]. The same holds as regards policies of matrimonial alliances: systems of generalised exchange expand the economical, social, and political "circuits of reverberation" which the restricted exchange does not allow for [18]. Thus these "cycles" generate semiospheres of variable amplitudes in all societies. Take for example the case of the "priesthood" semiosphere: it includes women in the Anglican church while it does not in the Catholic church; the amplitude of the former's sacerdotal semiosphere is broader than the latter's[9]. The approach we defined can model the connectivity and recursivity that generate the stability in distributive networks in such semiospheres. In other words, models developed in neurosciences and in the Theory of Resonance describe the consolidation of memory and cognitive structures, some relatively inert, others relatively flexible and innovative. Furthermore models of the same type can account for not only neural dynamics but also, extrapolated, for the dynamics of societies: of their representations of the world and of themselves, plus they can also map out vectors of disturbance stemming from discriminatory pragmatics (for example, with regard to women).

2.2.1 Implementation: "Attractors" and "Attraction Basins"

I will now illustrate our use of attractors and attraction basins. I excerpt from www.oceanie,org the attractor 'Ancestors'. to represent the traditional knowledge of Oceanians. The attractors we have selected constitute labile Memory Organization Nets whose dynamics vary from one part of the Pacific to another. The attractors and their basins make it possible to map what recent research calls socio-cosmic bases for geopolitics, on both large and small scales [3]. For us, a cluster of meaning takes shape around a central seme, to which we refer by the term "attractor". As we see below in Figure 3, an "ancestors" attractor occupies the centre of a cluster of meanings. The ideas that revolve around it emanate from it at the same time that they bounce back to it (reflecting barriers in terms of Markov chains [36], "circuits of reverberation" in neurosciences and in Resonance Theory [33, 36]). The basin of this attractor thus unfolds as "nodes" which emanate from it and which, in an inverse motion, consolidate the basin through their convergence on its polysemy. This modelling yields a representation of intersections of vectorial planes within a "culture" where repercussions of components impact each other with various amplitudes that define the scope of the basin that the attractor generates and is generated by[10]. The configurations of such universes of meanings vary of course spatio-temporally.

The hypertext and hypermedia modes also enable users to navigate by diverse and flexible means, making cross-references and associations that give access to information in the form of photos, digital videos, virtual objects that can be manipulated, and sound recordings.

If we click on "Ancestors" in Figure 2, the "attraction basin" associated with this attractor can be seen on the three concentric circles around it (Figure 3). The position of the satellite nodes, which represent other concrete realities in Oceania, corresponds to their semantic distance from the attractor at the centre. The diffraction of some nodes over several vectors illustrates the polysemic scope of cultural symbols.

In Figure 3, we can see that the first circle contains 26 nodes such as Taboos, Masks, Sacrifices, Trances, Cargo Cults, etc; the second and third circles contain fewer nodes - 20 in all. On the second circle we find Dances, Prayers, Funerals and Dreams; and on the third, Chiefs, Costumes, Jewels and others. Some nodes in a basin are connected to an attractor only by relays when others feed to it and are fed by it through direct inputs. For instance there is a direct link connecting "Ancestors" and "Mana" while "Parures" (Ornaments) on the third circle transit through "First fruits" or via "Dances" on the second circle, to make it to the first circle where the immediate associates of " Ancestors " are found.

The length of these "paths" (a term of Graph Theory) – direct or indirect – manifests the degree of semantic proximity between different nodes, displaying their strong connectivity. The set of diffractions and convergences generates the attraction basin of an attractor. And the connected nodes also work as attractors, hence the hypertexts that structure www.oceanie.org.

Oceanians find food for thought and discussion in these representations of connections and the bouncing of nodes on each other. Among them, story tellers as well as writersl use our graphs as sources of inspiration when they produce new narratives.

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[9] For developments concerning the semiospheres of mentsruation, extra-long penises, widowhood etc., [24, 37, see Ch 1.

[10] We thus reach the concept of transduction of the philosopher Simondon [50, p. 30]: "We mean by transduction a physical, biological, mental, social operation, by which an activity propagates gradually within a domain, by grounding this propagation on a structuring of the domain from place to place: each region of such structures is used in the following region as a principle of constitution ". We shall note the congruity of this theorisation with that of morphogenesis [40], see also the works of François Rastier on semiotics and cognition [45]. As for computer systems moving in some way along the same lines as we do, see *Atlas.ti* (Berlin), *Thinkmap* of *Plumbdesign* (New York) and *Verbatim* [14], which show a similar concern to represent knowledge multidimensionally.

Here, I suggest that the reader click on 'Possession' for videos and also on "Masks" or on "Statues" for 3-D manipulations.

3. PART THREE: FROM MORPHOLOGY TO MORPHOGENESIS?

The preceding section leads to a consideration of what might be a morphogenetic approach to myths and folktales as I have proposed it several years ago in Groningen [31]. I present here a somewhat revised version of some parts of that paper:

1. A myth combines Memory Organization Nets (MONs) and Imagination Structuring Processes (ISPs) through a bricolage of attractors as pre-stressed elements. New combinations reprogram former semiotic processors or alter the weights of semiotic loads, modifying transition probabilities (associative strength);

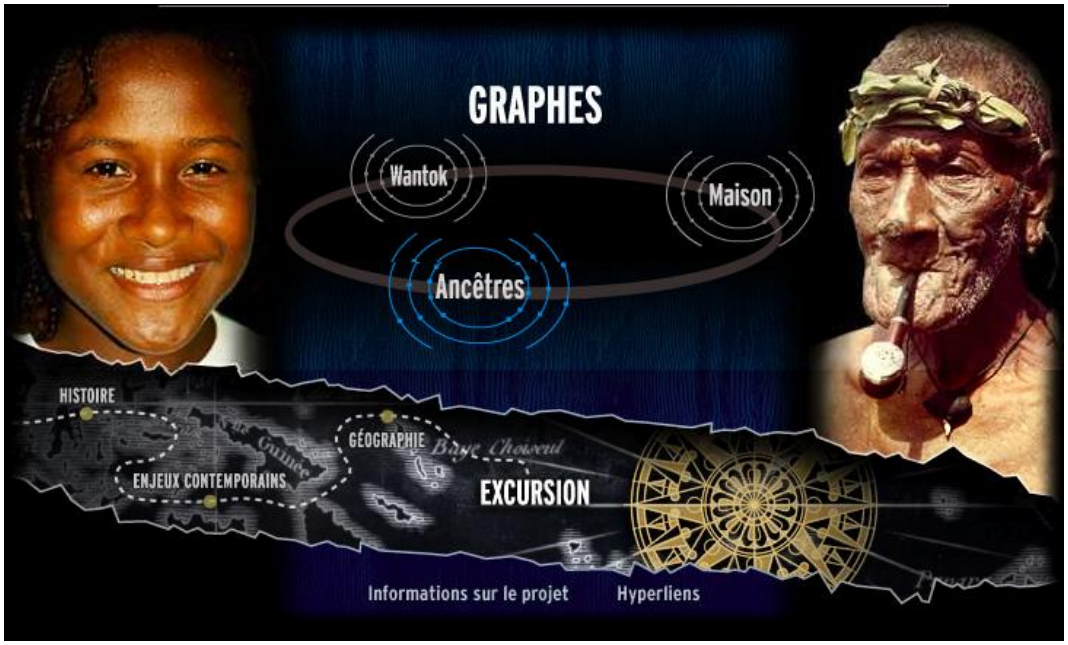

Figure 2. Front page of www.oceanie.org

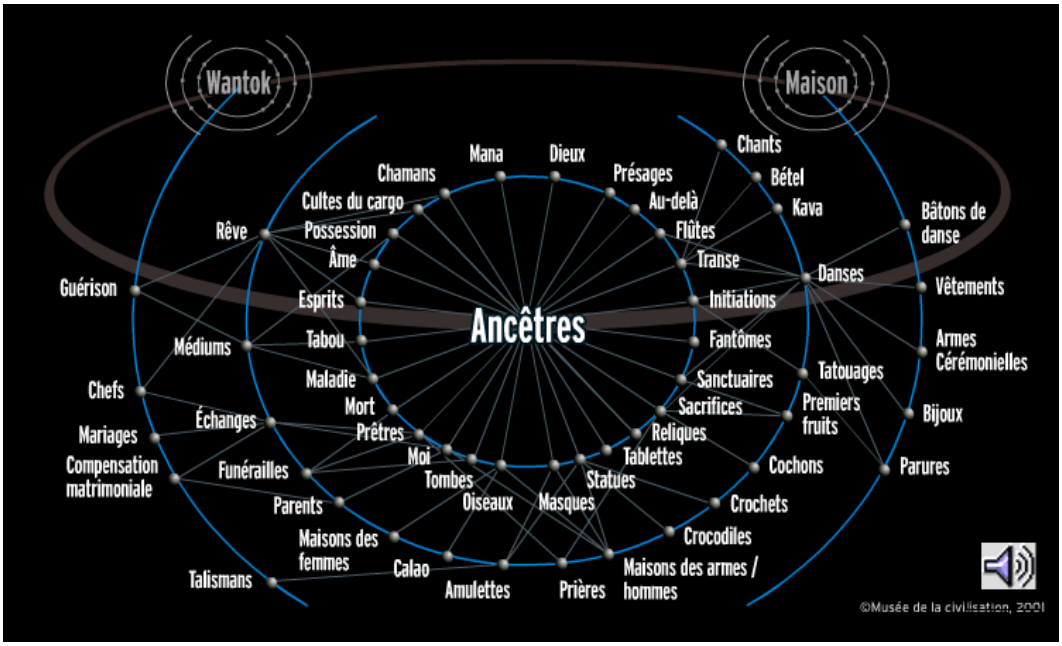

Figure 3. The attractor "Ancestors"

2. MONs and ISPs depend on pragmatics, hence on percepts and connotations;

3. The interplay of MONs and ISPs consolidates or restructures MONs according to transition probabilities;

4. High transition probabilities make for routines (seats of compatibilities, i.e., of inertia); low transition probabilities make for innovation possibilities (breakthroughs); null transition probabilities reflect incompatibilities;

5. Unless modified under stress, routines generate self-amplifying "cycles" in networks and consolidate MONs;

6. Innovations are based on ISPs;

7. Corollary to 1- 6: myths must be flexible or polysemic enough to cope with the interplay of routines and stress in order to allow for innovations, otherwise they collapse;

8. Transition probability computations yield a type of semiotic maps that represent the relative power of myths;

9. Such maps consist of Markovian networks that combine digraphic to probabilistic calculus;

10. DiscAn is a computer system to investigate and map out MONs and ISPs.

3.1 DiscAn: A Computer System for Content and Discourse Analysis

I designed the computer system *DiscAn*: *Discourse Analyser* to implement a dynamic procedure combining the Theory of Oriented Graphs with Markov chains of the first degree [22, 27]. DiscAn is a somewhat archaic computer system in that it still runs only in DOS - a Windows version was begun years ago but was not completed despite demand and a manifestation of interest by Microsoft. I had too much to do with my anthropological field work to carry on its reformatting as well as some improvements. Yet it is still used in different parts of the academic world. Unfortunately the source code has disappeared with my programmer but I can make the DOS version available.

3.1.1 Brief Presentation of DiscAn

DiscAn is a computer system for content and discourse analysis of a particular type. In addition to standard procedures for content analysis of natural languages (which requires ASCII input), DiscAn includes a MARKOVANALYZER for discourse analysis in terms of transition probabilities coupled to a digraphic calculus of node potencies.[11]

3.1.1.1 Thesaurus Building: Tagging a Natural Language Corpus in Terms of MOps as Associative Structures

Such associative sets are mapped onto tags either through listing (bottom-up description) or by rule (top-down taxonomic decisions). DiscAn offers both tagging procedures: through an on-screen interactive mode and through built-in thesauruses. The output is a "normalized" corpus, i.e. one whose lexical diversity has been reduced to semantic categories, i.e., where MOps are indeed indexed as "packages". Here, different types of factor analyses and contingency analysis are most useful tools [4, 46, 55] and the HEROFINDER program I have designed for in-house research some forty years ago. Of course thesauri can be hierarchically structured on as many levels as one wishes to but usually three levels suffice.

3.1.1.2 Definition of ISPs as Script Probabilities

Once the tagging operation is completed, DiscAn processes the normalized data by computing transition probabilities from one tag (node) to another. The algorithm is the one-step Markovian (first-degree chains). Thus the system generates MOPs from sets of MOps through the transition probabilities from MOps to MOps that in turn yield a MON with or without sub-MONs ("cut sets", etc.). The probabilistic linking operation displays all the active paths through the "slots" or MOps, i.e., it shows the "scripts" that have been implemented in the input text. l

3.1.1.3 Computation of MOPs Inner-Degrees (d_-)and Outer-Degrees (d_+) Taking Flows Into Account to Combine Quantitative and Qualitative Analysis

In this phase, DiscAn computes the flows through the net from node to node. This procedure allows for a measure of interplay between MOPs and ISPs, and it integrates to some extent quantitative and qualitative analysis, i.e., flows on the one hand and node input/output ratios on the other. Actually, the transition probabilities from node to node (MOp to other MOps) in a data set are computed concurrently with each MOp's diffraction (outer degree, d_+) and absorption (inner degree, d_-) coefficients. The resulting net (MON) maps a general memory organization system with three gradient facets: (1) inertia nodes, i.e., high- to low-frequency MOps whose d_+/d_- ratios = 1; (2) diffraction (or generating) nodes, i.e., high- to low-frequency MOps whose d_+/d_- ratios > 1; and (3) high- to low-frequency absorption nodes, i.e., MOps whose d_+/d_- ratios < 1. This operation loops back to 3.1.1.1 above, and may lead to a redefinition of lists or rules to specify MOPs and thesaurus revisions or revamping.

3.1.1.4 Dynamic Data Handling Through Digraphic Operations on MOps and MOPs, i.e. Through Script Operations in Which ISPs Act on MONs

To this point, DiscAn provides all the necessary computations to map transition probabilities between MOps, and transforms a set of MOps into a MON (with or without sub-MONs) as stated in 3.1.1.2 and 3.1.1.3. This specifies associative strength between MOps and provides measures of routine weight. High transition probabilities coupled with high frequencies and with d_+/d_- ratios = 1 define strong routines. Such consolidated routines maintain system inertia; they map the fundamental structure of a meta-text. ISPs bear only slightly on such routines which are "taken for granted" and constitute the more or less fuzzy postulates of a knowledge base whose dynamics is one of corroboration.

On the other hand, low transition probabilities coupled with high frequencies and a d_+/d_- ratio < 1 indicate "sinks", i.e., absorption

[11] It would be pertinent here to refer to deterministic or quasi-deterministic stochastic automata.

MOps. Such nodes are semantic dead-ends that may bug down enunciation unless positive regressive imagination processes (RIPs+) can act retroactively on them in order to increase the d_+/d_- ratio.

Then, low transition probabilities coupled with high or low frequencies and a d_+/d_- ratio > 1 define progressive imagination processes (PIPs) that provide for innovations, which is then achieved through a broader relationship system of MOPs, i.e., through an amplified MON whose density becomes higher. New connections will become possible and the whole MON or at least one of its constituent MONs will be revamped – like when a new unifying theory subsumes older and diverging ones.

Reinforcing or weakening d_+/d_- ratios as well as increasing or decreasing flows (frequencies) may result in considerable alterations of a MON. For example, in management as well as in advertising, PIPs are set to scanning MOPs in a MON so that eventual new connections are created and new cognitive habits and/or appetencies are stimulated. Likewise, in psychotherapy, RIPs (Regressive Imagination Processes) are activated so as to provoke abreactions that will neutralize, reorganize or revamp MONs.

Finally, simple algorithms of the same type as those to simulate MON modifications serve to generate new dynamic MONs. For example, the complement of the digraph of a tragedy (Jean Racine's *Andromaque*) through DiscAn generates a comedy structure [29]. In such operations, ISPs act on MONs along "what if" lines. Scripts of different kinds can thus be transformed by inversions, condensations, expansions, derivations, re-combinations and other similar graph-theoretic operations resulting in new knowledge configurations that may even restructure almost completely a knowledge map and its MON base -- as it happens in "scientific revolutions" and other creative texts.

4. CONCLUSION

The question of definition of operational analytical units is, in Petitot's words, "an extremely difficult problem" that "lies in holding together the paradigmatic (semantic "codes") and the syntagmatic (actantial interactions) levels".

Actually, in terms of their constituent units are folk narratives that different from life as paradigmatic sets and syntagms of thoughts and events? Might not paradigmatic sets - attraction basins and their probabilistic vectors - serve as analytic units in both cases? Back to trust: trust rests on inertia, i.e., one must believe that routines will remain sufficiently stable to enable one to lead a life without too much stress, with enough confidence in self and others to dwell in a secure mental and social space. Does not inertia empower existential dynamics that, might I say, would tend to strive toward an asymptotic model - as simplistic as it may be - that assures, through flattening the asperities of incidents, some mental and behavioral ease?

Humans, don't we live our lives as stories we tell ourselves? Aren't we scanning possible scripts - even unplausible ones like in daydreaming - leaving our ISPs working more or less under constraints? Aren't we processing at least occasionally our MOps to reorganize them in new MONs focusing on the best reminiscences we call upon? Aren't we even sometimes contemplating in counterfactual modes of thought paths that might have been open to us but that we never took: "Whom would I be if I had not met that person? What would I be doing now if had not attended this conference? Who would I choose to be if I were cloned?"

Don't weighed attraction vectors steer story tellers in their narratives like they steer our MONs and ISPs in everyday life and in scholarly writings as well [Darányi, in this volume]? After all, isn't life a story that we build as we live it?

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