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ROSAPIA LAURO GROTTO,
Department of Health Sciences, Psychology and Psychiatry Section,
University of Florence, Italy

MILOS BOROZAN
School of Psychology, University of Florence, Italy

THE EMOTIONAL ROOTS OF MENTAL LIFE: A CONCEPTUAL EXPLORATION ON THE ROLE OF EMOTION IN MENTAL SPACE

ABSTRACT: In the present paper we would like to explore the interplay between the two major innovative aspects of mental functioning as described by Matte Blanco, that is, the Bi-logical approach to thinking and the Theory of Emotion (Matte Blanco, 1975). The analysis will be achieved by referring to a formal approach based on a topological description of the mental space. We will describe the metric and ultrametric topology and show that these abstract structures correspond to the asymmetric mode (the Conscious system) and the symmetric mode (the Unconscious system) of the Bi-Logic model. We will therefore discuss the issue of emotion within the topologic formalism.

Key words: Emotional Roots, Mental Life, Mental Space, Metric Space, Ultrametric Space.

INTRODUCTION

According to Matte Blanco the Unconscious and Emotion appear to share some deep fundamental aspects; however emotional experience is always rooted in a corporeal *datum* (the sensation component). While Matte Blanco considers the sensation component as not specifically relevant in his understanding of the links between emotion and thinking, by explicitly stating that *to include these* (corporeal) *aspects in the concept of emotion was ultimately, a matter of convention* (Matte Blanco, 1975, p.307), we will argue that this component has a very relevant role in the topological model of mental function.

1. EMOTION AND THE MIND

Matte Blanco formalized the structural unconscious of Freud (Freud, 1915). He postulated the existence of the two basic logical principles of generalization and symmetry, which govern this *fabric of thought.*

Somewhat bizarre consequences of application of principle of symmetry impede its appearance in a pure form in the consciousness, so it is always contained in a tissue structured by principles of conventional thought. The human mind as seen by Matte Blanco is a stratified structure, the difference between the strata being the manifestation of varying proportion of the two modes of being. The more superficial ones (closer to consciousness) are dominated by asymmetric logic, whilst the more profound ones are where the principle of symmetry prevails. This interpretation of mind as an interaction between two modes of perceiving reality has as its consequence the redefinition of unconscious as a *quality* resulting from the relationship between symmetric mode and the intrinsic limitations of consciousness, which is incapable of holding infinite classes at once.

One of Matte Blanco's most interesting contributions is his *phenomenological-psychoanalytical-logical* theory of emotion. (Matte Blanco, 1975, p. 216) It is again a theory that presupposes two different modalities of perception and elaboration of emotional experience in what is usually a predictable sequence: the first is highly focused, immediate and coherent, and the second is diffuse, imaginative and resonant. In analogy with vision, Matte Blanco defines the first as *macular* and the second as *peripheral*. (ivi, p. 232) He asserts that, when some corporeal process awakens our attention, psychological registration of it in our macular consciousness gives birth to a pure, naked sensation. It holds the spot for just an instant, as it is immediately put in a relation with our past experiences, resulting in a perception, or if that is not available, an imagination. 'Putting in relation with' or establishing the relations between sensory data and existing mental elements is the essence of *propositional activity* which in it more asymmetrical form represents the cognition as it is usually conceived, the *cognition of the object*, and in its more symmetrical form can be seen as *cognition around the object.* The former is what we assume in conventional thought; the latter is characterized as unconscious. Because of incapacity of our macular consciousness to hold more than one thing at the time, in its focal part the images are formed mostly by using asymmetric relations and they lead to (re)cognition of the object, whilst peripheral consciousness is considered as the preferred habitat of sensation wrapped in symmetrized, loose clothing.

The symmetrized parts are visible in description of objects of our emotion such as loved ones, terrifying monsters hiding in darkness etc. In these cases, elements that cause emotions of love or fear are thought as having all of the properties resulting from application of the corresponding propositional function ('x is object of love' and 'y is a monster') in their maximum grades of expression. This is the only way that our consciousness has for representing the infinite classes denoted by propositional function - by making the individual stand for them (Matte Blanco uses the example of an *ambassador of a powerful country that himself is relatively powerless, but is the outward reminder of power behind him* (Matte Blanco, 1975, p. 298). More so, the definition of these classes as infinite, and as if they were containing discrete elements, is achieved by looking at them, so to say, from outside; in themselves they do not have elements nor can these be put in a serial order of any type as suggested by definition. But it is the only instrument at our disposal to refer to them. When we look at someone from a point of view of an emotion, we see him as representing the infinite class the denotes him, because is no other way to consciously think about the symmetrized content produced by emotion, and these embedded, wrapped cognition are the only way to do it.

Emotion has its conscious and unconscious aspects, or should we say its symmetric content is an infinite set confined by a set of asymmetrical relations acting as a bag, from which the translating function constantly strips away asymmetric contents. Since there are different emotions, there will be different bags, and different infinite sets. Emotion is therefore seen as a *mother of thinking*

(Matte Blanco, 1975, p. 303), an infinite reservoir from which consciousness can continue draining asymmetric relations. This can express one of possible origins of the word intelligence - *intellegere* (lat. to read within).

As just shown, Matte Blanco's most relevant contributions were devoted to exploring the implications of the presence of propositional activity as a constituent of the emotional processes. Emotion then, although experienced as a psycho-physiological event, in its purely psychological aspects, has two components - the capturing of corporeal events by the psyche (named by Matte Blanco *sensation-feeling*), and thought. This is not thought in its ordinary kind, as we seen - *emotion, insofar as it is emotion, does not know individuals, but only classes or propositional functions, and therefore, when confronted with an individual, tends to identify this individual with the class to which it belongs.* (Matte Blanco, 1975, p. 244).

However, it is important to remember that in the present case the infinite classes are denoted by a single propositional function that is anchored to the stimulus which gives rise to the emotion and which acts as the subject of the proposition (i.e. the *x,* in the propositional function 'x is object of love'). This imposes an intrinsic limit to symmetrisation, which is not present when we consider the symmetric mode of Bi-logic functioning per se. Here we would like to stress that, in our opinion, the corporeal counterpart of the emotional experience is functional in holding the symmetric components of thought by binding them to the source of the emotional response: no matter if the stimulus is exogenous or endogenous, it is something to which we respond to (e-motion). Emotional experience is rooted in an event. The event induces the symmetrisation, but also it anchors the more symmetric components of thought to the representation of the event which gives rise to the emotion. For instance, in cases of bursts of symmetrizing paranoid ideations, as soon as the patient clasps the sensory *datum,* the paranoia diminishes. Additionally, this mechanism is used as part of technique of negotiation in the situations including people being kidnapped and held as hostages, where they often can be identified by the attackers only as representatives of a certain class (bankers, westerners, Italians, Americans etc.), without reference to their asymmetric specificities such as their being living souls with lives, families, social ties and hobbies. Public appeals therefore, made in attempt of resolving the situation are in many instances focused on bringing this datum of reality to the eyes of attackers in hope of making them see their the hostages as people, so that they consequently give up on their intentions. Furthermore, the traumatic event in this light is made intelligible as the one that cannot be represented as an *event* whose symmetric components cannot be kept under control and so remain unrestrained. All of these are examples of sensory data and reality which set a boundary round the otherwise unbounded symmetric components of emotional experience.

2. SPATIALITY AND THE MIND

This extremely elegant way of representing the human mind and its elements, cognitions and emotions, with its eye-opening insights into human nature is in some ways reminiscent of Arthur Conan Doyle's dictum that *there is nothing more deceptive than an obvious fact*[1]. Matte Blanco tried to clarify the mutual relationships between the asymmetric and symmetric logic modes, and based on an analysis of different mental, linguistic and clinical phenomena, he concluded that *the heterogenic mode is the realm of the logical. The symmetric mode is the realm of the illogical. The Freudian Unconscious is the realm of bilogical structures and, as such, the realm of antinomies.* (Matte Blanco, 1975, p. 82). He states however, that the above conclusion is a consequence of a reflection in terms of classical logic, as it is used in thinking and reasoning. He clarifies that ... *if, instead, the question could be seen in the light of a unitary super-logic, which is not yet available (...), the conclusion just mentioned might no longer be true.* (ivi. p. 82)

Is there another way of presenting this strange reality that is human mind?
Arthur Conan Doyle, (1859 - 1930) Scottish writer and physician, the creator of Sherlock Holmes (A. C. Doyle, (1891), *The Boscombe Valley Mystery)*

First of all, we would just would like to point out that some relevant aspects of what is *mental* appears to be intimately linked to what is *spatial* in nature. What we would like to discuss here is a line of research in which the space-ness of the mind is critical feature of mental function.

For the moment we would like recall that is a straightforward and common-sense operation to consider that the similarity among two items, irrespective of their intrinsic nature, is equivalent to a kind of 'closeness', while difference is equivalent to 'distance'. In experiments performed with children as young as two or three, the standard way of presenting a classificatory task is by asking the child to recognize things that *go together* and separate them apart from other things that do not. They way in which children learn to manage the task is by *physically displacing* things that go together. Once they master the task in this way they are ready to classify in a more abstract sense. If one interprets the same evidence from a neo-Cartesian perspective one would say that children have an innate sense of *space-ness* and they very soon learn to adapt it to the requirements of the classification task.

A formal definition of the notion of space (see **Appendix A**) is provided in the context of topology. Roughly speaking the core problem of topology is to find the way to discover the global shape of a space from inside the space itself. One remarkable example is the torus (See **Fig.1**): a *torus* is a surface that is shaped like a donut, now imagine you are living on the surface of an immense artificial planet and you would like to acquire some knowledge about the shape of your 'planet': the topological solution to this issue suggests that you fix a starting point and you produce a series of very long paths on the surface on the planet, and each time you let a ribbon mark the path you have followed on the surface. All the tours must come back to the original starting point, so that they all are closed paths. Now you base yourself in the starting point and you consider the end of every single ribbon. Start to rewind the ribbon by progressively reducing the length of the closed path. If you are on a spherical planet this operation will be performed without problems: each closed path on a sphere can be reduced to a point-like path. But if you live on a torus in some cases the ribbon will reach a minimal extensions and it would not be possible to reduce the diameter of the closed path to zero. You have discovered that there is a hole somewhere 'out-there' and that your space is running around that hole. This is the type of ideas that are formalized in topological terms.

3. DEFINITION OF METRIC SPACE

A metric space is set that is endowed with the notion of *distance.* The metric space that is closest to our intuition is the three-dimensional space, endowed with an Euclidean notion of distance (for a more formal definition of metric space see **Appendix B**). The standard Euclidean distance is characterized by the so called Triangular Inequality, stating that given three points **a**, **b**, **c** it is always true that $d(\mathbf{a}, \mathbf{c}) < d(\mathbf{a}, \mathbf{b}) + d(\mathbf{b}, \mathbf{c})$. This inequality determines the shape of the triangles in our ordinary space: in all possible triangles one side has to be shorter than the sum of the other two sides, being equal to this sum only in the case that the triangle degenerates into a segment. It can be shown that the definition of a distance in a space implies the possibility of projecting a natural topology onto that space. A metric space in therefore also a topologic space.

4. DEFINITION OF ULTRAMETRIC SPACE

In what follows we well be concerned with a peculiar type of metric space, that is characterized by a notion of distance that satisfies the so called strong form of the triangular inequality. In the strong form the triangular inequality requires that for any points **a**, **b**, **c** be true that d=(**a**, **c**) = d(**a**, **b**)+ d(**b**, **c**).The previous definitions seem to provide quite an abstract way of defying a space (for a formal definition of metric space, see **Appendix C**). In order to make the whole story a bit more intuitive, let's consider the case the *semantic space*, in which the distance between two items can be perceived as a measure of the degree of semantic relatedness between them. Semantic space can be organized in hierarchical clusters. The cluster of 'living items' for example contains as a proper subcluster the cluster of animals and the cluster of plants, and so on. Nevertheless, each element of the subcluster keeps a certain level of differentiation from the other elements of the same subcluster, so that it is intuitive that the semantic representation corresponding to 'dog' should be placed closer to 'cat' than to 'robin', while the three taken together should be placed somewhere further apart from 'rose' and 'oak'. If an ultrametric structure is imposed on the same set by altering the metric of the semantic space, the way in which the various clusters are 'perceived from out-side' is deeply altered. First, all the items in the semantic space must be seen as belonging to hierarchical clusters. Second, if some items are seen as belonging to a given cluster, they must be *ipso facto* considered as indistinguishable from each other. This has the remarkable consequences that a set in an ultrametric space becomes indistinguishable from its proper parts. This is a very intriguing feature, and it allows us to re-define the characteristics of the unconscious processes as described by Matte Blanco in topological terms. First, the ultrametric space is hierarchically organized, with all the possible clusters can be seen as subclusters of larger clusters; second, the metric of the clusters is so defined that all the elements in a given cluster are seen as all equidistant from any other element of any other cluster, becoming therefore indistinguishable from each other; as a consequence, the whole cluster is seen as indistinguishable from its parts. Given these features of the ultrametric space it is clear that the symmetric mode as formulated by Matte Blanco is homologous to a topologic space endowed with an ultrametric structure. The generalization principle reflects the hierarchical nature of the ultrametricity, in which all the stimuli (or the concepts) are perceived as belonging to classes, and the classes are clustered into super-classes of increasing generality. Finally, a single omnicomprehensive class is generated. The principle of symmetry is a consequence of the strong form the triangular inequality stating that all triangles are isosceles in an ultrametric space.

5. SOME CONCLUDING REMARKS AND OPEN ISSUES

Can the topological description just explained facilitate the understanding of the mind and the role of emotion in the theory proposed by Matte Blanco? As a first point we can suggest that the contribution of emotion to the shaping of the mental space could be formulated in terms of a topological shift from a metric topology to an ultrametric one. A clear statements Matte Blanco's theorization is that it is in affectivity and in the emotional aspects of mental life that Bi-logic becomes accessible at the level of conscious insight: intense emotional states such the ones that are experienced when being in love seems to produce a symmetrisation in the thought processes with the consequence that the feelings are felt as absolute and totalizing. In any emotionally charged relational exchange the balance between metric and ultrametric topology seems to be biased in favor of the latter.

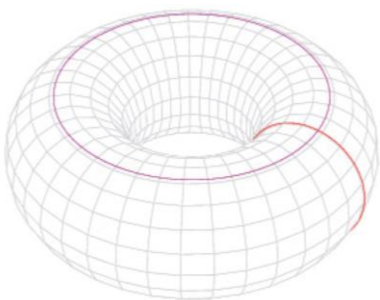

Figure 1. A *torus* contains some closed paths of irreducible length.

An important observation connected to the phenomenology of emotion that we have analyzed above refers to the fact the emotional experience is rooted in corporeal responses that are activated by the perception of the stimulus which gives rise to it. It is therefore triggered by an emotional event. This apparently trivial datum has profound implications with respect to our theory. An event is bounded to occur as a precise occurrence in time, and therefore if we consider the abstract topological description of mental space as such, it forces us to consider a temporal component to be added to the model. The model evolves from a topology to a *dynamic on topology* itself.

Furthermore, we have hypothesized that the rooting of the emotional experience in the body could anchor its more symmetrical aspects to the representation of the emotional event, which is definitely more asymmetrical in nature. Therefore, it is possible that the introduction of the emotional component into the theory could provide some valuable hints to the way in which we could solve the *Bi-logic dilemma,* that is, how to describe the way in which symmetric and asymmetric modes can be operationally put in relationship to each other. In an attempt to give a viable explanation for a transition from the more asymmetric to a prevalently symmetric mode of being, we suggest that it might be fruitful to attend to the sensation-feeling component of emotion, specifically to the corporeal events that cause it, bearing in mind that their inclusion in concept of emotion is far from *convention* as Matte Blanco considers it (Matte Blanco, 1975, p. 307). *Au contraire,* in our opinion they can provide the formal clue, possibly related to the concept of time[1], to solving the problem of the coexistence of symmetric elements and asymmetric ones.

APPENDIX A.

Definition of Topological Spaces

In formal topology the concept of space is defined having a Set as a starting point. A topological space is a set plus something else, or to say it in another way, a set that is characterized by a series of properties of the way in which you can combine the elements of the set. The formal definition goes as follows:

A topological space is a couple (X, T), where X is a set and T is a collection of

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[1]An interesting point of analogy has been detected by the theoretical physicist M.Rost (personal communication) who has recently explored the role of the time parameter in the fundamental equations of Quantum Mechanics. In fact, Quantum Theory has been originally represented by the Hilbert formalism in which time is not considered; in order to derive equations which describe evolution with respect to time, as commonly expected in physics (i.e. the Schrodinger and Dirac equations) it has been suggested that an implicit assumption can be made: the quantum system is related to a classical system which induces the definition of the time parameter in the quantum model (Rost, 2000). Apparently this fundamental problem of theoretical physics and the issue of relating the ultrametric and metric component of our 'psychological topology' could both be solved by referring to some extent to the same construct, that is, external reality (Lauro Grotto, R. & Rost, J.M. *(in preparation):* Introducing time in a structural formalism: a comparison between Quantum Mechanics and Psychoanalytical Theory.).

subsets of X, called *open sets of X,* having the following properties:

1) The empty set and X are open sets;

2) The union of an arbitrary number of open sets of X is an open set of X;

3) The intersection of any finite number of open sets of X is still an open set of X. The collection of open sets T is said to be a topology for the set X.

Just to give a simple example consider the set X={a, b, c} and let 0 denote the empty set.

The collections T1={0,X,{a}} and T2={0,X,{a},{b},{a, b}} are topologies on X, while the collection T={0,X,{a},{b}} is not, because it lacks of the union of {a} and {b}.

This is a formal definition that calls into question the way in which subsets (or classes) of elements in the space can be combined together by subsequent operations of union and intersection, the crucial issue being that all the possible combination must be allowed, and any resultant combination should be already there as an existing set (class) of the topology (X, T). This property provides the 'shape-ness' of the topological space, in the sense that a so defined topological space can be shown to be 'compact' and 'connected'. Compactness and Connectivity are formal properties, but they correspond to a good extent to our intuition of what it is like to have a shape.

APPENDIX B

Formal definition of metric Space

More formally a metric space is a couple (X, *d*), where X is a set and *d* isa function that associated to any couple of elements of X a real number that is positive or zero, being zero if and only if the two elements are coincident. A distance must be symmetric for the exchange of the two points considered, i.e. d(**a**, **b**)= d(**b**, **a**).

A metric space (X, d) therefore consists of a non-empty set X and a function d:X*X^[0,^) such that:

1. *(Positivity)* For all x, y e X, d(x, y)>0 with equality if and only if x=y.
2. *(Symmetry)* For all x, y e X, d(x, y) = d(y, x),
3. *(Triangle inequality)* For all x, y, z e X d(x, y)<d(x, z) +d(z, y).

A function d satisfying conditions (1.)-(3.), is called a *metric* on X.

Appendix C

Formal definition of ultrametric space

An ultrametric space (X, d) consists of a non-empty set X and a function d:X*X^[0,^) such that:

1. *(Positivity)* For all x, y e X, d(x, y)>0 with equality if and only if x=y.

2. (*Symmetry*) For all x, y e X, d(x, y) = d(y, x),

3. *(Strong form of triangle inequality)* For all x, y, z e X d(x, y)<max

(d(x, z),d(z, y)).

A function d satisfying conditions (1.)-(3.) is called an *ultrametric* on X. From these conditions, one can conclude several typical properties of ultrametrics. For example, in an ultrametric space, for all x, y, z in M and r, s in R:

- Every triangle is isosceles, i.e. d(x,y) = d(y,z) or d(x,z) = d(y,z) or

d(x,y) = d(z,x);

- Every point inside a ball is its center, i.e. if d(x,y) < r then B(x; r) = B(y; r);

- Intersecting balls are contained in each other, i.e. if B(x; r) fl B(y; s) is

non-empty then either B(x; r) £ B(y; s) or B(y; s) £ B(x; r).

As another example consider the Set of endless binary patterns a=(1,0,0,1,0,0,1,1...). These pattern can be viewed as the expression of a formal language with a two symbols alphabet. The pattern is therefore thought as generated starting from the first position on the left-hand side. Now we would like to introduce a notion of distance between two patterns a, b that considers the first position at which two otherwise identical strings start to differ. Be *n* this position. We assign a distance function that is equal to $(1/2)^n$: d(a, b) $=(1/2)^n$,where *n* is the ordinal number of the first position in which the pattern a,b are found to differ.

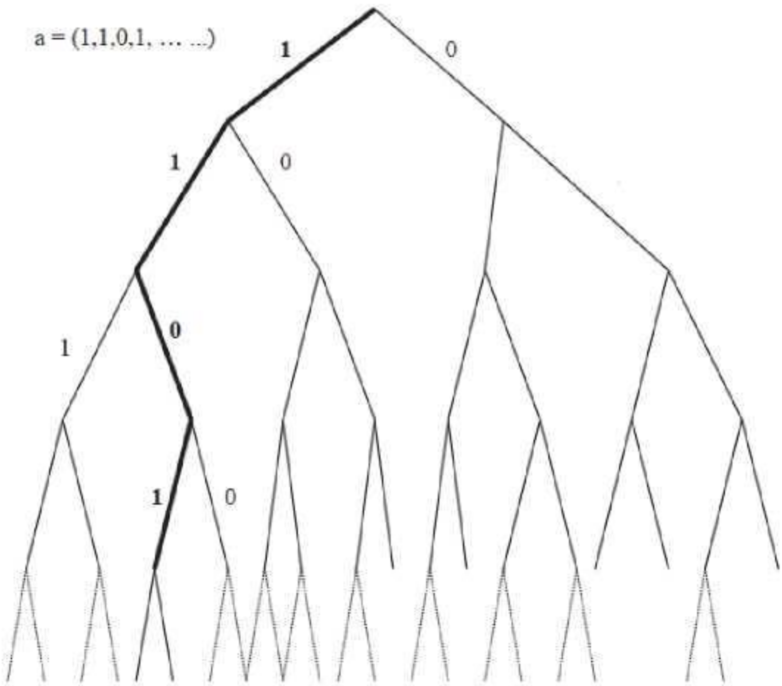
Let's introduce a few examples.

If **a**=(1,1,0,1,0,0,1,1...) and **b**=(0,0,0,0,1,1,1,1...) then d(**a**, **b**) $=(1/2)^J$=1/2 If **a**=(1,1,0,1,0,0,1,1...) and **b**=(1,0,0,0,1,1,1,1...) then d(**a**, **b**)

$=(1/2)^2=1/4$ If **a**=(1,0,0,1,0,0,1,1...) and **b**=(1,0,1,0,1,0,0,1...) then d(**a**, **b**) $=(1/2)^3=1/8$ If **a**=(1,0,0,1,0,0,1,1...) and **b**=(1,0,0,0,1,1,1,1...) then d(**a**, **b**) $=(1/2)^5=1/32$ If **a** and **b** do coincideat every position, then d(**a**, **b**) $=(1/2)^{n}$®^ =0.

The ultrametric space we have considered is a set in which the maximum distance between elements is 1/2. This distance is typical of all the patterns that diverge from the beginning, that is in the first position. A convenient way to imagine this space is by considering each pattern as produced by a hierarchical generative process that at each level chooses between two possible alternatives (1 or 0, or left or right...), (see **Fig. 2**) Once two pattern diverge at a single decision, they belong to a different branch of this hypothetical decision tree structure. An interesting feature of this way of organizing the patterns emerges once you consider the all set of patterns that share a given path along the decisional tree, let's say all the pattern that starts with the same triplet (1,1,0, ...) and differ thereafter. No matter what comes later, these patterns are all at a distance of (1/8) from each other. The ultrametric definition of the distance imposes therefore on the Set of patterns a very peculiar - and counterintuitive - hierarchical organization. All the patterns are naturally divided into classes, and all the patterns within a class are placed at the same distance from each other. Furthermore, if one considers all the pattern that belong to two different classes A and B, one finds that all the pattern in A are placed at the same distance from all the pattern in B. The distance is entirely determined by the class and once two patterns belong to a class they are seen as equidistant from any other point 'outside' that class.

Figure 2. A binary pattern in an ultrametric Space is thought as derived form a sequence of infinite dyadic choices. All the patterns that starts with (1,1,0,1...), as pattern **a** in the text, doshare the an initial path along the hierarchical decisional tree and belong to the same hierarchical cluster. They are all placed at a distance of at least $(1/2)^5$ from each other.



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