Logic in Love

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Abstract

Our research aims to advance a formal description of the implicit logic at the basis of the psychoanalytic theory and ground the rational components of our reasoning on their unconscious origin. Considering the Bilogic view of the Unconscious as a mainly symmetric setting, where only infinite objects exist and no singular objects are possible, this universal undifferentiated state is conceivable in terms of particular sets termed infinite singletons. This view allows us to both preserve the unitarity of objects and show that infiniteness, not finiteness, is the primary mode of sets, and therefore, of thinking. The pivotal consequence of the model is the idea that the unconscious elements cannot be characterised in absence of the external reality, which brings a collapse of infinite sets and allows for the emergence of linguistic representations.

In the paper we show that the features of the model correspond well to those universally attributed to strong emotions such as love and in particular to those pointed out by Dante in his Canto V of the Divine Comedy: its symmetry, its infiniteness, its "blindness" with respect to reality and its "unspeakableness", that only the words of poets can overcome: Amor, ch'a nullo amato amar perdona. (Love, which permits no loved one not to love.) - Dante Alighieri, Inferno, Canto V.

1 Introduction

Amor ch'al cor gentil ratto s'apprende... Amor ch'a nullo amato amar perdona... Amor condusse noi ad una morte.

Love, which in gentlest hearts will soonest bloom... Love, which permits no loved one not to love... Love lead us to one death. (Dante, Inferno, Canto V - translation by John Ciardi)

In his book *The unconscious as infinite sets* ([MB75]), the Chilean psychoanalyst I. Matte Blanco observes that infinite sets, that, in his view, describe the objects of the Unconscious, seem to apply to emotions equally well. In his Bi-logic, the Unconscious thinking, which can deal with infinite objects only, is the *symmetric mode* of thinking, where all relations are symmetric. Also, these structural features of Unconscious correspond very well to those of the most intense emotions, like being in love with someone. The great Italian poet Dante has very effectively described the symmetry of love in his famous verse *Amor*, *ch'a nullo amato amar perdona* (Love, which permits no loved one not to love). In the successive terzina he refers to the holistic nature of love, proper also of the objects in the symmetric mode: *Amor condusse noi ad una morte* (Love led us to one death).

Our proposal aims to advance a formal description of the implicit logic at the basis of the psychoanalytic theory in order to ground the rational components of our reasoning on their unconscious origin. We conceive the universal undifferentiated state of the deep Unconscious in terms of particular sets termed *infinite singletons* [BBL]. Specifically, we have developed a model of Bi-logic in first order language, on the basis of a model developed for quantum states, that can grasp the features of the primary process first characterized by Freud in his Interpretation of Dreams [Fr00]. The model also allows for an exploration of the origins of the logical connectives. This setting allows us to show that infiniteness, not finiteness, is the primary mode of sets, and therefore, of thinking. The unitarity of objects, even in a completely symmetrical context, where only infinite objects and no singular objects are conceivable, can be preserved by infinite singletons. The pivotal consequence of the model is the idea that the unconscious elements cannot be characterised in absence of the external reality, which produces a collapse of infinite sets and allows for the emergence of linguistic representations.

Such abstract features correspond very well to those universally attributed to love: besides its symmetry and its holistic nature, its infiniteness, its "blindness" with respect to reality and its "unspeakableness", that only the words of poets can overcome.

2 Freudian Theory

The foundations of the psychodynamic model of the mental apparatus are deeply embedded in Freud's early neurological works, especially in his book On Aphasia [Fr91]. There, he postulated a model of the mind-brain relations based on the idea of mental representation. Synthetically, mental representation is a sort of a psychic delegate of neural changes, and it allows for the establishment of the psychic structure of the human being. That is, mental representation can be considered the foundational unit of the psychic order. He distinguishes two types of mental representations: the thing- and the word-presentation. The former is the set of impressions, both sensory and motor ones, related to an object (which can be either internal or external), while the latter is a complex association of sensory and motor elements which defines a single word. In Freud's view, words acquire their meaning by being linked to a thing-presentation, and not by reference to the thing itself [Fr91] (p. 213). Therefore, this entails that the symbolic function of the mind depends upon the establishment of the associations between thing-presentations and the corresponding word-presentations. This statement was taken as the basis of the clinical practice of psychoanalysis, but its theoretical power has been somewhat underestimated.

Freud further elaborated this point in his later works and specified that not only the aforementioned two types of mental representations pertain to different domains of the psychic activity, but they also define two different mental systems, namely the Conscious and the Unconscious:

The conscious presentation comprises the presentation of the thing plus the presentation of the word belonging to it, while the unconscious presentation is the presentation of the thing alone. [Fr15] (p. 201).

Freud's approach is somewhat unique even in an epistemological perspective, and hence allows for addressing the issue of representation in new ways, in particular the issue of formal representation. These considerations successively enabled Freud to introduce and discuss the concept of Unconscious, surely the most widely known intellectual heritage of psychoanalysis. To delineate the conceptual border between the Conscious and the Unconscious, we must first distinguish between different psychodynamic conceptions of the Unconscious. The most widely accepted one is based on the idea of repressed content, such as representations of thoughts, impulses, and affects, which are inadmissible for the conscious self-image of the individual and therefore repressed. This idea informed the early view of psychodynamic practice as uncovering of the repressed, of overcoming resistance and becoming aware of one's admittedly unacceptable wishes and repressed memories.

However, the view we subscribe to in this paper has roots in the aforementioned structural contraposition of the *linguistic* Consciousness and *wordless* Unconscious [WP] (p. 131) and sees the Unconscious as a different type of mentation, comparable to the conscious one, in line with the first Freudian formulation of a theory of the Unconscious, that is, the one originally proposed in The Interpretation of Dreams [Fr00]. This theoretical position therefore defines the Unconscious not in terms of its content but in terms of its structure. Thus, the idea of structural Unconscious implies that any model of the mind must include a separate ideation, a different thought-constructing agency [Fr01]. The introduction of unconscious ideation as an equitable peer of the conscious one also requires a description of its organizing principles. The most notable description is found in the book The Interpretation of Dreams [Fr00], where Freud characterized Unconscious as akin to the so-called Primary Process. Namely, while the aforementioned absence of words from the Unconscious remains its most distinctive characteristic, its non-discursive nature is outlined by the following set of principles:

- Displacement;
- Condensation;

- Absence of contradiction;
- Substitution of the external reality with the internal one;
- Timelessness.

It is important to consider that, in Freud's view, the two conceptions of the Unconscious (the structural one and the repressed one) are not contradictory as the representations are found to be treated exactly in accordance with the laws of the structural Unconscious. These principles were later defined as laws of imagination by Langer [La] and hypothesized as a moving force of all art forms, among else. Likewise, these laws underline the fact that Unconscious thoughts are formed using particular methods of construction, association and synthesis, which are different from those of the conscious mind. For instance, the first two points refer to the tendency of the Unconscious to condense apparently different, even opposite, items of information and subsequently to its capability of seamlessly treating such peculiar mental objects. Subsequently, since the opposites condense together, there is no negation in the Unconscious, and hence the law of non-contradiction does not hold. While this original description relied on the elements of energetic, dynamic, and logical perspectives, the latter point was subsequently emphasized by Freud, underlying the fact that, in order to process the information, the Unconscious creates its own "logical environment", where one finds condensation and displacement rather than the usual logical connectives. In his words, The governing rules of logic carry no weight in the Unconscious; it might be called the Realm of the Illogical [Fr38] (p. 168). However, this important path, opened by the consideration of the logical features of unconscious ideation, remained almost entirely unexplored in the subsequents development of the psychodynamic theories. As notable exceptions, the Hungarian psychoanalyst Imre Herman [He] who proposed the idea that the deep Unconscious can only be described in logical terms, and the Italo-american psychiatrist Silvano Arieti who made an interesting comparison between the Aristotelian logic of conscious thought and the putative *paleologic* of Primary Process thought ([Ar], cited in [WP], p. 131).

It is only in the work of the Chilean psychoanalyst I. Matte Blanco that this aspect of Freudian thought received full consideration, as he proposed a reformulation of Freudian Unconscious in purely logical terms [MB75]. Namely, he described the Unconscious as a standalone way of thinking and being, denominated Symmetric Mode and characterized by two principles:

- the Principle of Symmetry;
- the Principle of Generalization.

According to Matte Blanco, the Unconscious Mode treats the asymmetrical relations as if they were symmetrical [MB75] (p. 38). The word symmetry refers to the *sameness*, identity between two things, and their fundamental indistinguishability. In particular, since the relation of contradiction is nevertheless a relation, the Unconscious treats the opposites as identical. Furthermore, since the time can be described as a series of moments where one follows the other, one bizarre consequence of the application of the principle of symmetry is the complete disappearance of time. On the other hand, the Principle of Generalization reflects the fact that the Unconscious does not deal with individual elements, but only with classes to which they belong. To provide an example, for the child, the mother is not represented as a single, individual person, she is rather a sum of all of the attributes of all members of its defining class: the class of mothers. That is to say, *motherhood* stands for the representation of all possible mothers in the Unconscious. Therefore, the individual thing is made identical to the class it belongs to. Based on Dedekind's observation that, if a set is equivalent to its part, the set itself is necessarily infinite [De], Matte Blanco's formal explanation accounts for the infinite, all-or-nothing character of Unconscious processes.

Subscribing to this perspective, as suggested by both Freud and Matte Blanco, the primitive roots of thinking are unconscious and hence the original mode of thinking is infinite. Recently, we have suggested that it is useful to reason considering finite as the negation of infinite and not the other way around (see [BBL]). In a way, language points us in a wrong way since the kind of infinite we are familiar with, that can be represented as the usual mathematical infinite, is only a derivative of the original symmetric infinite, and can only be conceived after the finitization of single elements.

3 A logical approach to the Symmetric Mode: Infinite singletons

Following *The Unconscious as Infinite Sets* [MB75], the guidelines for finding a logical embedding of the Symmetric Mode into the usual logical setting are provided by the assumptions:

- every set is infinite;
- every relation is symmetric.

However, relations are all symmetric only in singletons, for, if $a, b \in U$, and $a \neq b$, one can put an ordering relation: a < b. Then the solution is to have *infinite singletons*. How to conceive a singleton with infinite elements, as long as any set is determined by its elements, by extensionality? In the following, we see how to conceive an infinite singleton. One has first to consider that the notion of finite/infinite is level-sensitive, since a set may be finite at the meta-level but cannot be proved such at the formal, object level. For, the counting process implies the identification of the items. Then, even if a set $U = \{u_1, ..., u_n\}$ is recognized as finite at the metalevel, the same may not be possible at the object level, in case the formal system does not include the equivalence between the membership relation

 $z\in U$

and the disjunction

$$z = u_1 \lor \cdots \lor z = u_n$$

The idea is applied to singletons too: one can characterise the singleton $V = \{u\}$ extensionally, at the metalevel, even if the logical system does not assume the consequence

$$z \in V \vdash z = u$$

We would like to stress that this means also: no name for the object. This meets Freud's original requirement in On Aphasia, that is, Unconscious Representations (thing presentation) can access consciousness only when linked to words (word presentation), i.e., to finite representations [Fr91].

In order to characterise objects without words, namely, sets without elements, one can say that a set V contains a unique element when the universal and the existential quantification coincide for every A, namely, infinite singletons must satisfy the following equivalence:

$$(\forall x \in V)A(x) \equiv (\exists x \in V)A(x)$$

for every A, [BBL]. Subsequently, since:

$$(\forall x \in V)z = x \equiv (\exists x \in V)z = x$$

then any element $z \in V$, even if not recognisable, is unique. That is, one can conceive the uniqueness of an element exist even if the element itself is not recognizable nor characterizable at any level.

An infinite singleton V collapses into a finite one when the system can substitute the generic element $z \in V$ by a finite element u, namely the consequence:

$$(\forall x \in V)A(x) \vdash A(u)$$

holds, so that any formula $(\forall x \in V)A(x)$ is reduced to the propositional formula A(u) and, in particular, the infinite singleton is reduced to the extensional singleton $\{u\}$. Substitution is forced by the characterization of $z \in V$ as z = u within the system. Indeed

$$(\forall x \in V)A(x), z \in V \vdash A(z)$$

is true and then, if $z \in V$ is rewritten as z = u, the consequence

$$(\forall x \in V)A(x) \vdash A(u)$$

is derived by the laws of equality, assuming that z = u is true. In turn, in the hypothesis of equivalence between $z \in V$ and z = u allows to derive

$$A(u) \vdash (\forall x \in V) A(x)$$

Then, for finite singletons, *i.e.*, closed representations, the formulae $(\forall x \in V)A(x)$ and $(\exists x \in V)A(x)$ are both equivalent to the propositional formula A(u). For further discussion on this point see [BBL].

4 The symmetric features of Love

It is in affectivity and in the emotional aspects of mental life that some symmetric features become accessible at the level of conscious insight: intense emotional states such as being in love seem to produce a symmetrisation in the thought processes, with the consequence that the emotions are lived as absolute and totalizing.

Indeed, in the formal approach just derived, one can see that infiniteness, not finiteness, is the Primary Mode of sets, and therefore, of thinking. The Infinite singleton has a holistic nature that goes together with symmetry. Following Matte Blanco, this is due to infiniteness, that, in the reading of the model, actually amounts to the *undefiniteness* of infinite singletons. Thing presentations are detached from reality and therefore the definition of an object by characterization is not possible at this level. This accounts for the peculiar experience of dreaming, in which we are never fully aware of what is a dream really about. In the model of infinite singletons, it results explicitly that objects in the Unconscious Mode are Unspeakable. Infiniteness, fusion, unspeakability, blindness with respect to reality, are all features proper of Love, as well known to poets, mystics and artists.

4.1 Dante and the symmetry of Love

The three terzina of the Canto V of Dante's *Divine Comedy*, where Francesca opens her heart on the love story with Paolo and its tragic end, represent one of the most famous and poignant depictions of love ever written. The final words of Francesca's first speech to Dante are reported below. Only she speaks, whereas Paolo is silent, crying at the end, embodying the usual unspeakability of emotions and particularly Love. Francesca on the other hand gives voice to their love, painting a wonderful word-presentation of Love itself [Al].

Amor, ch'al cor gentil ratto s'apprende, prese costui de la bella persona che mi fu tolta; e 'l modo ancor m'offende.

Amor, ch'a nullo amato amar perdona, mi prese del costui piacer sì forte, che, come vedi, ancor non m'abbandona.

Amor condusse noi ad una morte. Caina attende chi a vita ci spense. Queste parole da lor ci fuor porte.

(Dante, Inferno, Canto V, 100-108)

In the translation by John Ciardi [Ci]:

Love, which in gentlest hearts will soonest bloom Seized my lover with passion for that sweet body From which I was torn unshriven to my doom. Love, which permits no loved one not to love, Took me so strongly with delight in him That we are one in Hell, as we were above.

Love led us to one death. In the depths of Hell Caïna waits for him who took our lives. This was the piteous tale they stopped to tell.

Let the Francesca's words take us into the Symmetric Mode of love:

Amor ch'al cor gentil ratto s'apprende... (Love, which in gentlest hearts will soonest bloom...)

Love, which takes possession of us, yields instantaneousness and rapture, it rules out time and ushers us into the dreamy world of the *Primary Process* (Freud 1900). The next terzina starts with a delightful and arguably clearest example of Symmetric Thinking:

Amor ch'a nullo amato amar perdona... (Love, which permits no loved one not to love...)

Then, as in a syllogism, to which the three starting sentences of the terzine:

Amor ch'al cor gentil ratto s'apprende... (Love, which in gentlest hearts will soonest bloom...) Amor ch'a nullo amato amar perdona... (Love, which permits no loved one not to love...

Amor condusse noi ad una morte. (Love lead us to one death.)

are often compared, we are conducted to a fusion, a fusion with the other, to the indivisible object which condenses all the opposites, life and death, Eros and Thanatos:

Amor condusse noi ad una morte. (Love lead us to one death.)

4.2 Logic in love

Love is often considered crazy. However symmetry does not spread out of emotions (see Matte Blanco, section 6 in [MB75]) and hence the kind of symmetry one can find in Love does not correspond to the kind of symmetry induced by a psychotic state. Indeed, in the first line of the terzine describing their love, Francesca herself attributes Love to al cor gentil/gentlest hearts. In fact, emotions have their own rules, based on the universality of bodily experience, as is well noticed in the phenomenological tradition. Therefore, emotional experience can be contained by virtue of it being rooted in the living body, according to a universal schema of all human beings. In Francesca's words Amor,... prese costui de la bella persona.../Love, ... Seized my lover with passion for that sweet body.... According to Matte Blanco, emotion, as a psycho-physiological event, in its purely psychological aspects, has two components: the captation of corporeal events by the psyche (*sensation-feeling*) and thought. However, the latter is not thought in its ordinary kind:

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. ([MB75] p. 244).

Such a modality is explicitely witnessed in Dante: Paolo, who is part of the category of "gentlest hearts", is forced to share its features: "Seized my lover..."

Amor, ch'al cor gentil ratto s'apprende, prese costui... (Love, which in gentlest hearts will soonest bloom, Seized my lover...)

In the next terzina Francesca applies the same schema, symmetrically, to herself:

Amor, ch'a nullo amato amar perdona, mi prese del costui piacer sì forte... (Love, which permits no loved one not to love,

Took me so strongly with delight in him...)

Notice that here a syllogism is perfectly recognizable: from the major premise "every loved person loves" and the minor premise "I am a loved person" (that is the conclusion of the previous terzina) Francesca gets the conclusion "I love". However, much more than a syllogism is said: Love is an attractor that forms a unity, and only being part of that unity allows to draw the conclusions. Our ability to derive the particular from the general, requires that the particular is identified with the general at a first stage, the stage of infinite singletons indeed. Emotion is therefore conceivable as a *mother of thinking* ([MB75] p. 303), an infinite reservoir from which consciousness can continue extracting asymmetric thoughts.

In human thinking, the overwhelming power of symmetry is somehow limited to reproduce the mixture of conscious and unconscious processes that is typical of it [MB88]. The normative dimension plays a crucial role in this respect: as postulated by Freud, the development of the Oedipal dynamics assumes a structural status with the introduction of the Super-Ego in the Second Topics (see *The Ego and the Id* [Fr23]). The Super-Ego is indeed the responsible for rules and judgements. We introduce some observations on the arising of normativity and its interplay with reality considering the final Dante's lines, reported above. In the last words pronounced by Francesca:

Caina attende chi a vita ci spense. (Caïna waits for him who took our lives.)

one can observe a sudden switch from the fusion just declared in

Amor condusse noi ad una morte. (Love led us to one death.)

to the neat characterization of subjects (in this case, her husband), expressed in a lapidary judgement on her husband and murderer. According to Freud, judgement is a landmark of the switch from the pleasure principle to the reality principle:

The performance of the function of judgement is not made possible until the creation of the symbol of negation has endowed thinking with a first measure of freedom from the consequences of repression, and, with it, from the compulsion of the pleasure principle. [Fr23], p.239.

In Dante's lines one can clearly pinpoint the departure from the pleasure dimension:

mi prese costui del piacer sì forte (Took me so strongly with delight in him)

notwithstanding the eternal persistence of Love

che, come vedi, ancor non m'abbandona. (That we are one in Hell, as we were above.)

In the penultimate line

Amor condusse noi ad una morte. (Love led us to one death.)

death is simmetrically associated to love and life, but the concluding word *morte* (death) indicates that an end, a border, a limit has been reached - the temporal limit of Paolo and Francesca's life and carnal love, executed by her husband. Indeed, the "third" comes in, imposing the end of fusion (a *de-fusion*), and the rise of separation, analogous to what happens in the core of the Oedipal dynamics, according to Freud. Individual characterization and reality are recovered. Once a temporal dimension is retrieved, the Secondary Process is reinstated and hence Bi-logic takes over the Symmetric Mode. Then Francesca can make (in the successive last line) her lapidary judgement on her husband and murderer. Her husband, as "the third", is not included in Love and her final words express a judgement on his act, not included in Love as well. Hence, a judgement signs the overcoming of symmetry. One can further notice that Francesca's judgement, which follows the recovery of the temporal dimension made possible by the word *morte (death)*, regains an eternal character itself -since Caina is eternal, Francesca is referring to the final judgement which will last forever. This is consistent with the fact that the notion of truth, which follows from the attitude to judgements, must be not contingent: indeed any truth requires at least a context in which it is necessary and forever so. Dante fully captures the role of time for the emergence of judgements and hence of the Secondary Process. For the role of time in Freud, see [No].

Standing on the shoulders of giants like Dante and Freud, we have tried to see how logic stems from emotions, adopting the explanatory capabilities of the Freudian theoretical apparatus expressed in terms of infinite singletons. In order to advance the formalization and understand how the overwhelming power of symmetry is overcome, finding a mediation between Symmetric Mode and reality, where judgements are formulated and truth values are established, further logical elements are needed, beyond infinite singletons. In [MB88] Matte Blanco describes the "fundamental antinomy" between the two modes of Bi-logic, the Symmetric Mode (infinite) and the Bivalent Mode (finite, due to reality). Via the introduction of modalities, we aim to study how the antinomy could be mediated, as investigated in [BBL2]. The modal operator of S4 (necessity) can be introduced, considering it as stemming from first order language, by which the infinite logical elements of symmetry have been modelled. It can represent the prescriptive element and acts as an abstract mediator to reality. It is remarkable that, as seen in [BBL2], by adopting the quantum logic of spins, necessity can be defined without reference to time. But it can also be obtained when a serial ordered relation, representing time, is introduced. In the second case, a new modality can be defined, so that a form of intuitionistic negation can be introduced. Then non-contradiction is obtained, leading to the Secondary Process.

In conclusion, as for Logic in Love, it was astonishing for us to discover how precisely fitting are Dante's words with respect to the Freudian theory, in its logically formalized version.

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