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An analysis of the direct reference theory

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Contents

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Introduction

This dissertation is concerned with referential semantics, i.e. the part of semantics that deals with the question of how the language terms we use (proper names, definite descriptions, natural kind terms) refer to their bearer. In considering these terms, I'd like to examine which type of theory — a theory of direct or indirect reference — is best suited to our nomination practices.

I will examine two major paradigms of the last century that are still the focus of debate: Frege and Russell's descriptivism of the sense of singular terms and the theory of direct reference (represented by Kripke, Kaplan, Putnam and Donnellan). These paradigms have been created from the central notion of "modality", which is the fundamental point of this dissertation.

The main goal of this dissertation is to investigate the following question: must we reconcile the concepts of meaning, modality and reason to formulate an adequate theory of reference? (as advocated by certain contemporary models such as two-dimensional semantics). In order to address this issue, I am going to examine different types of theories that combine and separate these three concepts in order to determine the best model.

In my first chapter, I will examine the three relations between these concepts: the Kantian link between reason and modality, the Fregean link between reason and meaning, and the Carnapian link between meaning and modality. In the second chapter, I develop the first paradigm in the philosophy of language due to the work of Frege and Russell and the objections this family of theories faces. In the third chapter, I develop the program of direct reference theorists (mainly Kripke and Putnam). I thus expose the fact that this type of semantic framework confers on singular terms a specific semantic property that makes it possible to distinguish the status of proper names from that of definite descriptions, which is not possible with the descriptivist framework of Frege and Russell. Indeed, while proper names and descriptions are both singular terms, they are significantly different in an aspect of rigidity that confers on proper names, demonstratives and natural kind terms a link with their referents through direct causal relations, whereas definite descriptions are a "mediation" between the name and its bearer.

I propose to examine the epistemic and metaphysical consequences of Kripke's semantics. The epistemic consequences of the program are very important and derive from its theory of reference: in fact, the Kripkean program will make it possible to found two new relations: the contingent a priori and the necessary a posteriori — where until now contingency was traditionally associated with the empirical way in which we are able to describe the world and to know it — and necessity was associated with the fact of being independent of experience and therefore, a priori. I propose to examine Kripke's thesis of the necessary a posteriori, which poses major problems concerning essential properties — properties that are constitutive of objects — and the way in which we can come to discover essences. After examining how necessity a posteriori and essentialism - i.e. the thesis that there are essences in nature - can explain discoveries in chemistry and biology, I examine two objections against the essentialist model.

My last chapter examines an answer to reconciling the necessary and the a priori after Kripke. I examine Alan Sidelle's modal conventionalism, which stands in direct opposition to Kripke's realism, to show how it is possible to justify the use of modalities, and principally of the necessary a posteriori so useful in explaining certain discoveries, on the basis of our conventions.

Chapter 1 :

Three concepts (and relations) for a theory of reference

1.1 - Presentation of the chapter :

In this first chapter, I would like to present three concepts which are fundamental for the theories of reference: the first one is *meaning*, the second one is *reason* and the third one is *modality*. By presenting these concepts, my aim is to show the link between them.

The first relation I will consider is which we attribute to Kant in the *Critique of pure reason* (1781) According to this view, there is a link between reason and modality because he suggests that "what is necessary is knowable a priori, and vice versa" (Chalmers 2005, 55). As we shall see later in the chapter devoted to Kripke's theory of direct reference, this link may not be so obvious. The second relation I will examine corresponds to the link between reason and meaning with the Fregean analysis of sense and reference (1892). Frege's semantic theory is an indirect model of reference, arguing that there is a link between reason and meaning "by proposing an aspect of meaning (sense) that is constitutively tied to cognitive significance" (Chalmers 2005, 55). I will examine the Fregean theory and the difficulties it poses, in particular for the question of the cognitive value of identity statements. Finally, the last relationship was proposed by Carnap in his book *Meaning and Necessity* (1947) by introducing the central concept of intention that is constitutively tied to possibility and necessity.

1.2 - On the two ways of seeking knowledge: rationalism and empiricism

In his book *Critique of pure reason* (1781/1788), Kant investigates the question of what we can know, i.e. determining the limits of knowledge?[1] To do this, his starting point is to defend the idea that there are two types of knowledge, radically different in their principles and methods: on the one hand, what he calls "pure knowledge", and on the other, what he calls "empirical knowledge". What are they?

In the history of modern philosophy, there is a division between philosophers who maintain that all knowledge of the world derives from our ideas. This rationalist conception of knowledge was defended by Descartes, Malebranche and Leibniz. In the first part of *A Discourse on Method* (1637), Descartes stated that the fact of being able to know an object was equal in all men but the possibility of such knowledge is not due to our experience of the world but on the contrary "the power of judging correctly and of distinguishing the true from the false (which is what is properly called good sense or reason)". In short, this position, commonly referred to as "innatism", maintains that all knowledge derives from ideas. In response to this analysis of knowledge, other philosophers defended the opposite position: empiricism. This position, defended in particular by Locke (1690) and Hume (1739, 1748) states on the contrary that "We have no source of knowledge in *S* or for the concepts we use in *S* other than experience" (Markie and Folescu 2023).

The Kantian proposition about the nature of knowledge is quite different: indeed Kant proposes to say that "all our cognition starts with experience, yet it does not on that account all arise from experience". (Kant 1781, 136). Thanks to the division between two major types of knowledge, empirical knowledge and knowledge independent of experience, this leads Kant to defend the idea that some of the knowledge we have is a priori. This distinction will lead me to answer a difficult question: how can the the truth of a statement be established? To answer this question, I will introduce two types of categories: modal categories and epistemic categories.

[1] This debate on the nature of knowledge is still present, particularly in the context of development and scientific advances, but that's not the point I'm leaving aside.

1.2.1 The analytic and the synthetic : the epistemic categories

By dividing the knowledge that comes from experience from the knowledge that comes from our ideas, we have set out two different processes: a priori knowledge and a posteriori knowledge. A priori knowledge is knowledge that is established on ideas alone and without any recourse to experience of the world, whereas a posteriori knowledge requires experience of the world in order to be established.

There is a certain class of statements that do not in fact need experience to be recognized as true: for example, if I say that "all triangles have three angles", this statement is true *in virtue of* the meaning of the term 'triangle' because the predicate "to have three angles" is contained in the term 'triangle'. In this case, It is not necessary to experience the world in order to know that the statement is true. According to Kant, the fact that applying a predicate to a subject is a *judgment*. When the predicate is already contained in the subject, we say that the judgment is analytic, i.e. true by virtue of its meaning.

Nevertheless, there are a priori judgments that are not analytic: for example, "the sum of the angles of a triangle is equal to 180°". In this second case, we know a priori that the statement is true because mathematical objects — which are abstract objects — cannot be known by experience (because they exist independently of it). Nevertheless, I cannot deduce from the term 'triangle' the property "to be equal to 180°". So this kind of statement shows that the predicate is not contained in the subject. Consequently, this kind of statement extends our knowledge of the world. To resume, we have to call "analytic truth" a truth which is established a priori just in virtue of the meaning of a term, and we will call "synthetic truth" a truth which is established a priori but in which the predicate is not contained in the subject.

Now that we've examined the cases of statements that are independent of experience, let's look at those that depend on it. Most ordinary statements, but also in the natural sciences, are based on our experience of the world. Let's take an ordinary statement such as: "Aristotle is the author of *Metaphysics*". Given that it's not contained in the proper name "Aristotle" that this man possesses the property of being the author of *Metaphysics* then it's necessary to do an experience of the world to know that Aristotle have this property. When an experience of the world is required to establish the truth of a statement, we label this statement as "a posteriori".

The fact of being established a priori or a posteriori characterizes epistemic categories, i.e. categories that answer the question of how to establish the truth of a statement: either reason or experience.

1.2.2 - The necessary and the possible: modal categories

When we say that a statement is true or false, we need to mobilize another type of category : the modal categories. In the history of logic, Aristotle has developed in his treatise *De Interpretatione* an analysis of different modalities : necessity, possibility, contingency and impossibility. I will just insist here on the distinction between necessity and contingency. Traditionally, a statement is necessary if it's "always true" but this expression is ambiguous[2]. In Aristotle logic, a example of necessary statement can be a mathematical one. For example "2 + 2 = 4" is necessary because no other result is possible. In contrast, a statement is contingent when it is true in some circumstances and false in others. For example "Plato was a philosopher" is a contingent fact because things could have been different in several ways. When a statement can be true in some circumstances and false in others, we say it is contingently true. In formal logic, the contradictory category of necessity is contingency.

1.2.3 - From a priori to necessity: the Kantian identification between reason and modality

One fundamental question raised about the contingent and the necessary which are *modal categories* is the problem to know if a proposition that is necessarily true implies being known only a priori? Kant defends the idea that we are in possession of certain *a priori* cognitions and he insists on the fact that this type of cognition is present in all individuals because it's the condition of possibility of the comprehension of scientific knowledge. The relation between necessity and *a priority* can be represented by two conditions: (1) "First, then, if a proposition is thought along with its necessity, it is an a priori judgment" and (2) "Thus if a judgment is thought in strict universality, i.e., in such a way that no exception at all is allowed to be possible, then it is not derived from experience, but is rather valid absolutely a priori" (Kant 1781, 137).

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[2] In fact, in the following chapters of this dissertation, I will say that a statement is necessarily true if it is true in all counterfactual circumstances (or possible worlds). The notion of possible worlds will be introduced in chapter 3.

I will call "principle of the apriority of necessity" the principle according to which a statement known independently of experience is necessary and the converse principle which I call "principle of necessity of apriority" which stipulates that a necessary statement implies to be known independently of experience[3]. Thanks to this connection between a priority and necessity, the first side of Chalmers' golden triangle is drawn.

[3] In the chapter devoted to modality and reference and Kripke's direct reference theory, I will show the difficulties of this theoretical equivalence between modal and epistemic categories.

1.3 Frege on the relation between reason and meaning

Given that I have examined the way in which Kant linked reason and modality in the previous section, the next question we can ask ourselves is the following: how does Frege account for the link between reason and meaning?

1.3.1 Identity as a starting point.

In "Sinn Und Bedeutung" (1892), Frege proposes to examine the concept, and a fortiori, the relation of equality. The starting point is to ask the following question: let's consider two statements with the following forms: *a=a* and *a=b*. What is the difference between these two statements?

According to Frege, the answer to this question is related to what he calls "cognitive value". The cognitive value of a statement is determined by modal and epistemic categories. Thus, a statement such as "a=a" radically differs from the statement "a=b" in virtue of the fact that the former is analytic, i.e. necessary and a priori. It is necessary and a priori because this proposition asserts only that an object is identical to itself and to nothing else that is distinct from it. For example, if I said "Cicero is Cicero", this statement is tautological or analytic but if I say "Cicero is Marcus Tullius" the second statement is *informative* for several reasons. In fact, 'Cicero' and 'Tullius' are two proper names which refer to the same individual Cicero but knowing that Cicero is identical to Tullius is not an a priori process, but an empirical one, even though the names 'Cicero' and 'Tullius' refer to the same object.

The two statements differ in their respective epistemic profiles because we don't need to experience the world to conclude that Cicero is Cicero. Nevertheless, only empirical research into the history of ancient philosophy has established that Cicero is Marcus Tullius. This type of identification is common for ordinary facts, but also in the natural sciences. To convince ourselves, let's take a (hackneyed) example from the philosophy of language, the Hesperus-Phosphorus case. The Ancient Egyptians has observed an interesting phenomenon in astronomy: because of Venus proximity to the sun, they had made observations and concluded that there was a certain celestial body visible in the east in the morning. This celestial body was given the name 'Phosphorus'. After observations at the end of the day, they observed another celestial body visible in the west in the evening and gave it the name 'Hesperus'. From a scientific point of view, the question was whether these were indeed two

distinct objects, or the same object seen from two different positions? The famous conclusion was that it was the planet Venus, seen from two different positions. However, the fact that Hesperus and Phosphorus are the same object should not be confused with the scientific discovery itself.

Just because the names 'Hesperus' and 'Phosphorus' refer to the same object doesn't make their identity trivial. On the contrary, these two identity facts differ in both their modal and epistemic profiles. According to Frege, the fact that Hesperus is Hesperus is necessary and a priori whereas the fact that Hesperus is Phosphorus is contingent and a posteriori[4].

1.3.2 A two-levels (dimensional) semantics: sense and reference

In his paper, Frege proposed a theory of the meaning of referential terms on two levels: sense and reference? What is it? First of all, we have to distinguish two types de terms: *general* and *singular* terms. A general term is a term that can be applied to a plurality of objects. General terms have two types of semantic properties: connotation and denotation (or extension). For example the term 'bachelor' is a general term which implies a certain conjunction of properties, namely that of *being a person* and of *being unmarried*. A general term always connotes properties. The extension of a general term represents the set of objects that satisfy the properties expressed by the predicate.

What about singular terms, i.e. terms that have only one referent? According to Frege, "any designation representing a proper name, which thus has as its reference a definite object" (Frege 1892, 37). Names such as 'Geneva', 'Switzerland' or 'Marie Curie' are proper names and therefore refer to a single object.

A satisfactory theory of the sense of referential terms must be able to answer the question of how our terms refer to their bearer. To answer this question, Frege introduces the mysterious concept of "sense" which he describes as follows:

"The sense of a proper name is grasped by everybody who is sufficiently familiar with the language or totality of designations to which it belongs" (Frege 1892, 37)

[4] As we'll see with Kripke's theory of direct reference, considering the identity of Hesperus=Phosphorus as contingent will not be obvious.

This characterization is not very clear and involves adding other elements: for example, it would be necessary to provide a criterion for determining when a person is "sufficiently familiar with the language". As Frege himself points out, we should even be able to say immediately whether any given sense belongs to it. To such knowledge we never attain. Let's put this difficulty aside. The fundamental question here is to give an explanation of the way in which singular terms refer. Frege goes on to explains the following:

"The regular connexion between a sign, its sense, and its reference is of such a kind that to the sign there corresponds a definite sense and to that in turn a definite reference, while to a given reference (an object) there does not belong only a single sign" (Frege 1892, 38).

Let's take an example with the name 'Bern'. This proper name 'Bern' is the sign, or a "linguistic tag" to employ a Millian terminology. The name refers to a particular object — Bern a city located in Switzerland — through a singular description designed to capture the object in question (e.g. *the capital of Switzerland*). From this example, we can see that the sense of a proper name determines its reference by a definite description, i.e. an expression of the form "the x such that *F*x" where x is a singular constant designating a certain entity or thing and *F* is an individuating property of x. According to Frege, all singular terms who have a referent are determined in the same way.

Now that we've set out Frege's analysis of singular terms, I'll explain how he applies his theory to statements.

1.3.3 Sense and reference of statements

In semantics and linguistics, an expression can be evaluated using two criteria: one is syntactic, i.e. relating to the arrangement of terms in a sentence, and the other is semantic, i.e. relating to the meaning of the various terms in a sentence. Consider the following sentence :

(1) Carmen in an _____ citizen

From a grammatical point of view, this sentence is syntactically incomplete because a sentence is complete when it contains enough terms to give it meaning. In this case,

the sentence cannot make sense because a predicate would have to be added to describe Carmen's nationality.

(2) Santa Claus doesn't exist

From a grammatical point of view, this sentence is syntactically complete but there is a problem which Frege underlined in the article that we should be suspicious that this sentence makes sense. In fact, the proper name 'Santa Claus' does not refer to any individual. If, as Frege maintains, sense determines reference, then a term that has no referent cannot allow a proposition to have meaning. The proper name 'Santa Claus' can easily have a sense, such as "the man who brings presents to children on the night of December 24-25" without it existing in reality. What conclusions can we draw from these two examples? First of all, that a statement can't make sense if all its parts don't make sense: this is known as the principle of compositionality. According to this principle "the meaning of a complex expression is fully determined by its structure and the meanings of its constituents" (Szabó, 2022).

Although I've explained how to distinguish between a meaningful and a nonsensical statement, I haven't specified the sense of a statement in Frege's theory. To give a precise answer to this question, we need to examine another article by Frege, published in 1919 under the title "Der Gedanke". In logic, we classically say that a proposition is a statement that is either true or false. For example, the proposition "Socrates is Platon's master" is true in our world[5].

In his paper, Frege begins by characterizing, without defining, what a thought is as follows:

"I call a thought something for which the question of truth arises. So I ascribe what is false to a thought just as much as what is true. So I can say: the thought is the sense of the sentence without wishing to say as well that the sense of every sentence is a thought. The thought, in itself immaterial clothes itself in the material garment of a sentence and thereby becomes comprehensible to us. We say a sentence expresses a thought" (Frege 1919, 292).

If this characterization is correct, we say that a statement is said to "express a proposition" but what does it mean? A thought is an expressive relationship between language and the object to which it refers.

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[5] The question of whether the truth value of the proposition "Socrates is Plato's teacher" varies across possible worlds will not interest us in the context of the Fregean theory of sense and reference.

There is a distinction at three levels. Thoughts are mental representations and linguistic representations. Both representations can have the same content. These contents are propositions. Propositions are the content of either psychological or linguistic representations. It's important to distinguish between what we sometimes metaphorically call the vehicle and the content. Statements and thoughts are vehicles, some linguistic, others mental. They are the vehicles of content. The content of a mental or linguistic vehicle is a proposition - and this is exactly what Frege means when he talks about Gedanke.

The next question is the following: if the sense of statements is a thought, that is, a proposition, all that remains is to examine the reference of the statements. How can we determine the reference of a statement?

In his paper "Der Gedanke", Frege introduces the idea that the notion of truth if fundamental for a theory of meaning. Indeed, a satisfactory theory of the meaning of statements must be able to differentiate between the true and the false. This idea is central to Frege's project, as he will support the thesis that the reference of a statement is its truth value. Let's consider the following statement:

(3) In 2024, the actual President of the Swiss Confederation is Viola Amherd

This statement expresses the thought of *being the current President of the Swiss Confederation in 2024*. This thought is the sense of the statement. The reference of this statement is its truth value, the real thing. The thought expressed by this proposition is true because a state of affairs in the present world has been achieved. Consequently, the truth value is TRUE. Now, let's consider another statement:

(4) Water is the chemical compound with the HO formula

The history of water is natural science is a very interesting case: Cavendish has discovered hydrogen in 1766 and Priestley has discovered oxygen in 1774. Some scientists had assumed that water's molecular formula was HO. They therefore believed that proposition (4) was true. But (4) is wrong, because we've known since 1871 from Cannizzaro that the crude formula for water is H_2O.

Thanks to this example, we can derive the general principle that if a fact described in a proposition occurs then the proposition is *true*, and if a fact turns out not to be the case then the proposition expressed is *false*.

Now I must comment on another kind of statement, namely statement about nonexistent objects. Frege asks the question to know "Is it possible that a sentence as a whole has only a sense, but no reference?" (Frege 1892, 41). To answer this problem, he explains that "one might expect that such sentences occur, just as there are parts of sentences having sense but no reference. And sentences which contain proper names without reference will be of this kind" (*ibid*).

Let's take Frege's famous example about Ulysses: "Ulysses was set ashore of Ithaca while sound asleep". It's clear that the name 'Ulysses' have a sense (e.g. 'the hero of the *Odyssey*') but even if this name have a sense, it is clear that it has no referent, because the referent of a singular term is a specific object. Given that there is no object in the actual world that is Ulysses, we must conclude that Ulysses does not exist.

This conclusion has a strong implication for propositions about nonexistent objects: let's remember us that in semantics, the possibility of a sentence having a meaning is determined by principle of "compositionality" (i-e: the meaning of a complex expression is fully determined by its structure and the meanings of its constituents—once we fix what the parts mean and how they are put together we have no more leeway regarding the meaning of the whole). If this principle is correct, it implies that the example about Ulysses should be analyzed in this way: given that 'Ulysses' is a singular term that refers to nothing, this implies that the proposition cannot be given a truth-value because part of the statement cannot be evaluated. Frege's conclusion for cases of non-existent objects is that these statements are neither true nor false, but indeterminate.

1.3.4 The implications of Frege's theory of sense and reference for the connection between reason and meaning.

According to the theory I have outlined, we can see the outline of the second side of the golden triangle. In 2004, Chalmers has explained that "Frege linked reason and meaning, by proposing an aspect of meaning (sense) that is constitutively tied to cognitive significance" (Chalmers 2004, 153). Thus, the Fregean articulation between sense and reference shows that the extension of an expression does not in general determine its cognitive significance.

On the contrary, extension does not determine cognitive value but it's the sense of an expression that determines it. By showing that it is meaning and not reference that is responsible for cognitive value, this helps to explain why when two statements

contain two co-referential terms, one can be known a priori (independently of any experience of the world) and is at the same time necessary, and the other is known only a posteriori (experience of the world is therefore required to know that the statement is true) and is at the same time contingent[6].

[6] We shall see, however, that Frege's conclusion no longer enjoys consensus in the philosophy of language: a statement such as "Hesperus is Phosphorus" will not be contingent a posteriori, as Frege maintains, but "necessary a posteriori" (according to Kripkean analysis of modalities).

1.4 Carnap on the link between meaning and modality

Chalmers (2004, 2005) has explained that the third side of the "golden triangle" should be attributed to Carnap. According to him, the link between meaning and modality is due to "an aspect of meaning (intension) that is constitutively tied to possibility and necessity" (Chalmers 2004, 153). First of all, I will introduce different notions due to *Meaning and Necessity* (1947). The first one is equivalence.

1.4.1 What is equivalence?

Equivalence is a phenomenon which is everywhere, from ordinary life to natural science, mathematics and philosophy. Classically equivalence is relative to *facts* about the world. For example, Correia (2016, 103) speaks about "factual equivalence" defining this relationship as follows: "Say that two sentences are *factually equivalent* when they describe the same fact or situations […] Factual equivalence is a form of "sameness of content". Let's take different examples to clarify this definition. For example, if I say a first statement "I'm a bachelor" and a second statement "I'm an unmarried man", these two grammatically distinct statements are in fact equivalent in terms of content. They both describe the fact that *I am single*. Another example: if I say "Genève est située dans la partie française de la Suisse" and "Geneva in located in the French part of Switzerland", these two sentences describe the same fact. Although there are two changing grammatical structures linked to translation between French and English, the content expressed by a speaker is the same. If a bilingual English-French speaker understands the meaning of the first sentence and the second sentence, he or she will conclude that they express the same thing. One last example: suppose I own a gold ring and I say "this ring is made of gold" and "this ring is composed entirely of the element that has the atomic number 79" (even if nobody would say this sentence), the conclusion is that both propositions express the fact that the ring has the property of *being made of gold*.

Now that we know what equivalence is, let's take a look at how logic presents this relationship: if two sentences are equivalent, we write the following formula:

$$A \equiv B$$

To be able to use a relation in logic, it must be formalized by inference rules, semantics etc… Carnap (1947, 5) defines the following rule of truth for the equivalence relation:

> A sentence $S_1 \equiv S_2$ is true if and only if either both components are both true or both are not true

For example, "Hesperus is Hesperus" ≡ "Hesperus is Phosphorus" are equivalent because the expressions 'Hesperus' and 'Phosphorus' are just two names to designate the same object. We can say that these two expressions are equivalent in virtue of this *factual identity* between two proper names which co-refer to designate the same object, describe the same fact.

Thanks to this formalization, Carnap derives the following principle according to which "Two sentences are equivalent if and only if both have the same truth-value, that is to say, both are true or both are false" (Carnap 1947, 6).

1.4.2 From equivalence to *L*-equivalence

Carnap introduces a new type of concepts he calls "*L*-concepts" apply these concepts to different logical relations, as well as to truth and falsity. He uses this concept because his goal is to develop a *modal interpretation* of semantics, i.e. to integrate expressions such as "it is necessary that", "it is possible that", etc. into standard semantics and to give a logical interpretation of these expressions. Carnap starts with the idea that the concept of *L*-truth will give an explanation of "what philosopher call logical or necessary or analytic truth" (Carnap 1958, 7).

Carnap proposes to give an interpretation of modal logic — i.e. the part of logic that examines the meaning of expressions such as "necessary", "possible" and others — with the concept of "state-descriptions" to make a connection with truth. The role of a state-description is to give 'a complete description of a possible state of the universe of individuals with respect to all properties and relations expressed by predicates of the system" (Carnap 1958, 8). Given that the role of a state-description is to describe the way in which the universe presents itself then if the description described by proposition *S* does not describe the world, then this proposition is false (*L*-false). Conversely, if the description described by proposition *S* describes the world, then this proposition is true (*L*-true). We may wonder why Carnap introduces these concepts into a system of logic that already includes solid concepts? According

to him, the introduction of this concept class is used to give them a better definition and characterization.

First of all, Carnap starts with the idea that with a definition of *L*-truth by defining that : A sentence *P*, is *L*-true (in S_1) if *P* is true in every state-description of the system. This characterization can can be considered analogous to the characterization of logical necessity because a proposition (or a sentence is logically necessary if and only if the fact described is compatible (i.e. non-contradictory) with logical laws. Without going into all the relationships established by Carnap, we come to the central one, that of *L*-equivalence. According to this analysis, two expressions P_1 et P_2 are equivalent in a system if and only if the statement is *L*-true. According to this system, two expressions like: "Hesperus is Hesperus" and "Hesperus is Phosphorus" are equivalent because both facts described are true.

Now that I've defined and characterized the equivalence relation and the idea of *L*-equivalence in Carnap's system, we'll briefly outline his method of "intension and extension", which is a key relation for grasping the connection between meaning and modality.

1.4.3 Intensions, extensions and the link between meaning and modality

Let's turn now to the core idea of the Carnapian presentation. To evaluate linguistic expressions, Carnap proposes to develop what he calls "the intention and extension method". What exactly does this method consist of?

Logic and the philosophy of language classically distinguish two type of properties of linguistic expressions. This distinction applies to all expressions: singular terms, general terms, predicates and statements. The first type of semantic property is *extension*. As we say with Frege, the sense of a singular term is a *mode of presentation* and the reference (denotation or extension) is the referent. Thus, the extension of the proper name "Aristotle" is the individual designated by the name and corresponding to the properties we commonly associate with it: Aristotle.

Carnap's method for extension comes back to Frege's. According to this view, all terms have an *intension* and an *extension*. For singular terms which Carnap calls "individual expressions" extension corresponds to the individual to which it refers and intension corresponds to an "individual concept". An individual concept is a singularizing condition that only an object must satisfy in order to be the referent of

the description. Let's take an example: in our world's history, among a large quantity of facts, we commonly attribute to Kurt Gödel the property of *being the author of the incompleteness theorem in mathematical logic*. Given that this expression must select a single individual then we can say that Gödel is indeed the referent of the description (and therefore its referent) if he satisfies the individual concept which corresponds to Gödel. Let's look at the statement itself: the statement describes a fact about Gödel, but it is possible that we have attributed the discovery to an author who was not in fact the author of the theorem, but we cannot know this solely on the basis of experience. Although we could always learn new things about the theorem, we have to consider that the referent of the description is — or is not — Gödel. Thus, we can conclude that the referent of a statement is its truth value. To conclude this chapter, the question I will consider is how Carnap linked meaning and modality?

In his system, Carnap introduces *L*-truth concept which corresponds to the necessity operator in modal logic, which can be expressed as "it is necessary that". To characterize this operator, he introduces "states-descriptions" which correspond *possible worlds* or *counterfactual situations*, i.e. ways in which the world could have been. Consequently, the constitutive link between meaning and necessity is explained by the

fact that if (i) intension determines extension, and (ii) the extension of a statement is its truth value, then we can conclude that (c) a statement that is true in S1 (and a fortiori true in all state descriptions of this world in virtue of the relation between intension and extension) means that the statement is necessary.

Chapter 2 :

The descriptivist picture of singular terms and its limits

2.1 Presentation of the chapter :

In this chapter I would like to analyse an important "paradigm" in the philosophy of language before the Kripkean revolution in 1970: the descriptivism of singular terms. According to this view, proper names should be considered as abbreviations of definite descriptions. For example, let's consider Aristotle. We know that Aristotle was a an ancient Greek philosopher, born in Stagira and so on. The property of *being a Greek philosopher* is is not an individualizing property of Aristotle's. Nevertheless, some of the properties we commonly attribute to Aristotle allow us to refer to him in a singular way. For example, Aristotle was Alexander the Great's teacher, or Aristotle is the author of the *Metaphysics*. The facts described in these descriptions select only one individual. As I shall show, these examples raise a number of difficulties concerning the modal and epistemic status of statements mobilizing a proper names and an associated definite description.

2.2 Origins and foundations of the descriptivist semantics

The origin of descriptivist semantics comes from a work[7] that predates the 1905 article. In this text, Russell devotes chapter 4 'Proper names, adjectives, and verbs' to the question of the nature of these terms and their link with the concept of truth. Russell's approach can be summarized by the following formula, which he himself uses: "*Words* all have meaning, in the simple sense that they are symbols which stand for something other than themselves" (Russell 1903, 70). What does Russell's proposition mean and what does it imply?

According to this view, propositions not only contain terms whose function is to refer to objects, propositions also contain the entities to which the term refers. To show this, Russell explains that in the case of a proposition of the form "I saw a

[7] I refer to the *Principles of Mathematics* published in 1903.

man in the street" this proposition refers to a certain specific object, and not to the concept of man. The possibility of reference to a specific individual implies that the meaning is not exhausted in the act of reference but extends to something more, namely the entity designated by the proposition. In the same way — to take Kripke's example of the man who drank champagne — although we may not refer perfectly to the man to whom we are ostensibly referring, we are referring because the term-referent relation is not exhausted in language.

What about the relation between a proper name and the object to which it refers? In the later article "The Philosophy of Logical Atomism" (1956), Russell explains that "the only kind of word that is theoretically capable of standing for a particular is a *proper name*, and the whole matter of proper names is rather curious" (Russell 1956, 28).

This thesis is fundamental to Russell's general theory. It implies that natural language expressions are directly or authentically referential. The implications are demanding: if we maintain that the terms of language are directly referential, this implies that 1/ in order to be able to interpret a proper name in a sentence, we must be able to know to which object the name refers. The problem is that we commonly use proper nouns to make vague references, without being expert users of the noun, and 2/ if two proper nouns refer to the same object, then replacing one proper name with the other in a sentence should not change the meaning of that sentence. The second point is one of the major problems of the Russellian form of descriptivism. Before coming to the various puzzles proposed by Russell in 'On Denoting', it is important to clarify what a description is.

2.3 What are descriptions?

In various area of knowledge, descriptions are important: in ethics, to characterize what is good or bad, in science to distinguishing truth from falsehood, in aesthetics to separate beauty from ugliness… In short, we use descriptions in all fields of knowledge, right down to ordinary situations (e.g: the woman who drinks champagne is happy).

In his paper "On Denoting" (1905), Russell separates two "types" of "denoting phrases" : indefinite and definite descriptions. An indefinite description takes the following form "an *F*". Indefinite descriptions are used to describe the general

whereas definite descriptions refer to the particular. For example, if I say "a man is sick" this expression is radically different from the one who would say "the man in this room is sick". One of Russell's goals in this paper is to develop a theory of sign and meaning. According to Russell, the conditions that make a sentence denote or not denote lie solely in its form. When we make propositions with definite descriptions like "the author of *Naming and Necessity* is dead" this expression has three elements: existence, unicity and predication.

Existence comes first, because the expression "the author of *Naming and Necessity*" shows that there is a certain object x to which we can attribute the property mentioned in the description. In other words, existence comes first, because applying a property to an object first requires that the object in question exists.

Second, this definite description refers to one and only one object. Consequently, one of the semantic properties of a definite description is to include, in addition to existence, a uniqueness clause. Finally, the last clause of a definite description is predication, i.e. the process of applying a property to an object.

Predication can apply to a singular object (e.g. Socrates) or to a set, a class of objects (e.g. the set of red things). In the case of a definite description, the object targeted by the description must be unique and the property expressed must be singularizing, otherwise the proposition is general.

Thus, the theory of definite descriptions can be presented in the following way: for any expression *E* of the form singular term-predicate, we can change the singular term (a proper name) by another category of singular term (a definite description) which will select one and only one referent.

Now that I've explained what the definite descriptions consist of, I'll turn to the puzzles developed in Russell's article.

2.3 Some puzzles for A theory of reference

According to Russell, "A logical theory may be tested by its capacity for dealing with puzzles, and it is a wholesome plan, in thinking about logic, to stock the mind with as many puzzles as possible, since these serve much the same purpose as is served by

experiments in physical science" (Russell 1905, 484-485). Let's take the co-reference puzzle for singular terms which comes from Frege's "Sinn Und Bedeutung"[8] paper.

"If *a* is identical with *b*, whatever is true of the one is true of the other, and either may be substituted for the other in any proposition without altering the truth or falsehood of that proposition" (Russell 1905, 485)

Let's take an example to illustrate this: it is the case that Romain Gary won the Goncourt prize in 1956 for his book *Les Racines du ciel*. The rules of the fixed competition do not allow you to win the prize twice. In 1975, he entered for the prize under the pseudonym "Emile Ajar" for his book *La Vie devant soi*. If we follow Russell's model presented above, there's no problem. Given that, Romain Gary has two proper names to refer to itself, it is not contradictory to apply the following scheme:

Premise 1: Romain Gary is *the author of Les Racines du ciel*
Premise 2: Romain Gary *is* Émile Ajar
Conclusion: Émile Ajar is *the author of Les Racines du ciel*

In this type of case, there's no problem and no contradiction. Given that 'Gary' and 'Ajar' are just two names that refer to the same individual, then there's no problem, as this argument is compatible with the description of the facts in the actual world. However, a major problem arises when we prefix statements (1) and (3) with an propositional attitude[9] like 'know', 'would like' and so on as shown by the following argument:

Premisse 1: Anna wished to know that Romain Gary *is the author of Les Racines du ciel*
Premisse 2: Romain Gary *is the author of Les Racines du ciel*
Conclusion: Anna wished to know that Romain Gary is Romain Gary

[8] The co-reference puzzle for singular terms was to answer the question of what is identity? In the chapter on sense and reference, I showed that if two expressions "a" and "b" were two terms referring to the same object then two statements like "a=a" and "a=b" differ in their cognitive value by virtue of the fact that the former is trivial while the latter is informative, in the sense that it extends our knowledge. From this first puzzle follows a second one linked to psychological attitude verbs and Leibniz's law.

[9] A propositional attitude is a psychological state typically described in English by the form: *subject + attitude verb + "that" clause + embedded statement.* These are attitude attribution statements. We can distinguish between the psychological attitudes themselves and the statements that describe these mental states.

In this type of case, we immediately see the paradox in attitude contexts. If Frege's theory were correct, it should be able to differentiate between the semantic role of a name and the role of a description. Nevertheless, Frege's theory is not competent to account for this kind of context because the third should be true, but is false. Linguistic contexts that violate this law are called "opaque" contexts. Conversely, contexts that conform to this law are said to be "transparent". Frege's solution to transparent contexts is as follows: as a general rule, statements designate their referent, and their referent is the truth value of the statements. The same applies to singular terms. Frege's hypothesis is that a singular term, and any denotative expression embedded in it, has its reference changed. It changes its reference. Attitude verbs change the reference of singular terms. What is this new reference according to Frege? When we describe people's attitudes, we're describing how people think about these objects.

Russell's solution to these puzzles is different. Russell suggests that these puzzles show that "the whole distinction of meaning and denotation has been wrongly conceived" (Russell 1905, 487). He assumes that the expressions 'Romain Gary' and 'l'auteur des Racines du ciel' directly represent their referent. The problem with Russell's solution to this puzzle is that it cannot account for the fact that two different names imply different uses. In short, if the names are not interchangeable, this shows that the truth value of propositions is not the same when we substitute one proper noun for another, as long as these two proper names are co-referential.

2.4 The puzzle of negative existentials and the theory of definite descriptions

Russell (1903, 1905) proposes to investigate a particular type of statements: statements which asserts that there are objects that don't exist. Nonexistent objects can be purely *fictional*[10] (e.g: Sherlock Holmes, unicorns…), *scientific objects* whose existence has been postulated (e.g: Vulcan) or objects with contradictory properties that do not allow the object to exist (e.g. the round square).

First of all, we can say that the nonexistence of these objects does not have the same status and is not due to the same causes. For example, the existence of objects with contradictory properties, such as a figure being round and square at the same time, is

[10] Moreover, not all philosophers categorically deny that fictional entities do not exist; a more complete notion of existence would have to be defined.

not only physically impossible, but also logically impossible, insofar as such properties violate logical and mathematical laws; it is also metaphysically impossible, i.e. impossible by virtue of the nature of things: it is in fact impossible for a geometric figure to be both round and square, because it is part of the essence of a geometric figure ***G*** to be determined by properties such as its form.

Now let's take a look at some cases in which it is not "necessarily false", i.e. objects whose existence is not a priori contradictory. Let's take the following statement (5)

(5) Santa Claus does not exist

To evaluate this statement, we have to mention it contains a singular term 'Santa Claus' that Russell calls a "grammatical proper name" i.e. an ordinary proper name whose function is to refer to a single object, be it a person, an event, a city or a country. If we start again from the principle that proper names are words to designate individuals, we can ask ourselves whether the solution proposed by Russell is still valid, since it does not seem to be a theory that can account for the reference to the nonexistent. To solve this problem of reference to the nonexistent, Russell defends a differentiation between two types of proper names: grammatical proper names and genuine proper names. When we use genuine proper names as indexicals 'I', terms designating properties 'roundness', the meaning is exhausted in the object to which the term refers whereas the other category of 'ordinary' proper names that Russell calls 'grammatical proper names' must be analysed by definite descriptions, i.e. a description of the form [the x such that *F*x] where x is a singular term and *F* is an individuating property of x.

2.5. Remarks and critics of the descriptivist model

What conclusion should we draw from Russell's analysis of definite descriptions? We can deduce from this paraphrase between names and descriptions that proper names are merely descriptions in disguise. But if this conclusion is correct, what are the implications of this general theory of descriptions? How can we still distinguish between proper names and definite descriptions? In fact, one of the main difficulties of the descriptivist model is the fact that in general, it's not necessary to have in mind singularizing properties to refer to a singular object. For example, if I'm speaking about Aristotle, I'm able to deal with this philosopher just saying that he's an ancient

Greek philosopher. In this case, my use of 'Aristotle' is linked to a general description and by the use of an indefinite article.

In addition, Russell's model is too demanding for non-expert users of names to be able to refer to it. It often happens that people who refer to objects using singular terms such as proper names or natural kinds terms are not experts in what they are referring to. Let's take the question: what is gold? We can answer this question in several ways, depending on our relationship to the object. For example, a person who wears gold jewelry might describe it as a metal used to make jewelry, while a name expert (e.g. a chemist) might say that gold is the element with the atomic number 79. In this example, we can see perfectly well that a non-expert user can refer to an object, even in a vague and imprecise way, without any problem in fixing the referent.

But a much more important problem arises in the context of description theory. If proper names were merely disguised descriptions, this would imply that we shouldn't make distinctions in terms of semantic function. This consequence poses a fundamental problem for Russell's descriptivist approach to the meaning of singular terms because the absence of distinction between names and descriptions implies that a statement mobilizing a proper name ***N*** and an associated definite description ***D*** of the form ***N=D*** should be equivalent in terms of modal and epistemic profile to an ***N=N*** statement asserting that an object is identical to itself. Associating a property with a singular object by means of a definite description cannot be the same as saying that an object is identical to itself and to nothing else that is distinct from it.

In fact, the major problem with Russell's descriptivism is that it fails to differentiate between the semantic role of a name and that of a description. Let's take an example, the following propositions:

(5) Saul Kripke is *the author of Naming and Necessity*

and

(6) *The author of Naming and Necessity is the author of Naming and Necessity*

If descriptivism is true, one substantial problem appears here because if the semantic role of definite description is to give an abbreviation of proper name we must admit that (5) and (6) are equivalent. Is it really the case? On the contrary, it seems clear that

these two propositions are quite distinct from one another, both in their modal and epistemic profiles.

In fact, it seems clear that (5) is informative because it's contingent and a posteriori whereas (6) is just necessary and a priori known because of the identity relation. It's contingent because the facts could have been radically different from what they are. Kripke might never have been interested in philosophical questions and never gave the *Naming and Necessity* lectures at Princeton in January 1970. Nevertheless, it is impossible for Kripke, if he is described as the author of *Naming and Necessity*, not to be the author of *Naming and Necessity*, as this would be tantamount to saying that an object may not be identical with itself, which is absurd. To solve this problem posed by descriptivism, I will examine one argument by Saul Kripke (the modal argument). Kripke's argument is designed to offer a new paradigm in semantics based on rigid designation and causal relations.

2.6 The modal argument

According to Frege-Russell descriptivism, a singular term (e.g 'Aristotle') can be replaced *salva veritate* and *salva informatione* through a singular description about the object described. More precisely, this version of descriptivism argues that a singular description about an object gives the sense of the name.

For example, in our world, Bern is the capital of Switzerland, Aristotle is the author of *Metaphysics* and so on… We commonly apply properties to objets thanks to descriptions. The article 'the' in English (which we replace with 'le' or 'la' in French) is used to make a singular reference. This implies that — if the descriptivist theory were true — then Bern could not not have been the capital of Switzerland. Nevertheless, we could imagine that Luzern or Zurich could perfectly well have been Switzerland's capital if things had gone differently. According to descriptivism, to assert that it could have been the case that Bern was not the capital of Switzerland would be a contradiction *in adjecto* because each proper name must be associated with a uniquely definite description. This proposition is the starting point for Kripke's strongest argument: the modal argument.

The goal of the modal argument is to oppose the idea that a definite description gives the sense of a proper name. In the second lecture, Kripke formulate this idea as

follows (Kripke 1980, 71): "The statement, 'If *X* exists, then *X* has most of the φ's' expresses a necessary truth".

Let's assume that a name can be defined by a definite description, giving as an example that Aristotle is the author of *Metaphysics*. When we do this, we define Aristotle as necessarily possessing this property (because if a definition attributes a property to an object, then it must not fail, otherwise it's no longer a definition). One implication of descriptivism is that if we assert that a noun is synonymous with a description, then we can substitute one for the other without changing the content and truth value of the statement. Let's now consider two statements about Aristotle:

(7) Aristotle is Aristotle

(8) Aristotle is the teacher of Alexander

Let's evaluate (7). In this context, we are just saying that an object is identical to itself. Logically, the proposition expresses an analytic truth that is necessary and established a priori, without the intervention of experience. Nevertheless, proposition (8) seems to express a different content for knowledge: it seems to extend our knowledge of Aristotle because we apply a property to him that we must discover to establish whether or not it is possessed by him and we learn something about Aristotle. If this conclusion is true, it implies that the semantic role of descriptions is not the same as that of singular terms.

This distinction between names and descriptions is the purpose of the modal argument I'm now going to explain. (By modality, I mean the modal categories of classical logic, the necessary and the possible, which we express by a square and a diamond respectively). If (7) and (8) are true, we can infer (9)

(9) The teacher of Alexander is the teacher of Alexander

This statement has all the characteristics of a tautology, and as such expresses a necessary truth because tautologies are analytic, i.e. they are necessarily true and established without recourse to experience, a priori. If (9) is true, we can logically prefix the expression with the necessity operator as follows

(9') Necessarily, the teacher of Alexander is the teacher of Alexander

According to descriptivist theories of sense, an occurrence of the name can be substituted for the occurrence of the description. If we accept (9) then we must accept (9'), because I just add the necessity operator which further emphasizes the trivial aspect of the truth that is expressed by the proposition (9). If (9) and (9') are conjointly true, I can truthfully say that:

(9") Necessarily, Aristotle is the teacher of Alexander

Nevertheless, an important problem resurfaces here: should we consider that (9') and (9") express the same thought, that they have the same content? According to Kripke, the transition from (9') to (9") is not obvious from a semantic point of view and from a knowledge perspective. In fact, he notes that the last two statements have neither the same content nor the same truth value. To justify this point, he explains that:

> Suppose we agree to drop 'Aristotle' and use, say, 'the teacher of Alexander', then it is a necessary truth that the man referred to is Alexander's teacher-but it is a contingent fact that Aristotle ever went into pedagogy, though I am suggesting that it is a necessary fact that Aristotle has the logical sum, inclusive disjunction, of properties commonly attributed to him. . . . (Kripke 1980, 74)

With this argument, how can we show that descriptivism is false? Let's use our modal intuitions about Aristotle and Alexander to imagine what might have happened to them. Is it necessary for Aristotle to be the teacher of Alexander? The answer to this question would appear to be no. Indeed, if a property is necessary for an object to exist, this implies that it cannot exist without it. Given that it seems contingent that Aristotle have this property. Kripke appeals to our intuitions about Aristotle. If we can imagine a counterfactual situation — a different story — about Aristotle's life, then this property is accidental and the fact about him is contingent. Inversely, if we cannot imagine a situation in which Aristotle doesn't have this property, then this implies that the property expressed in the proposition is necessary. In this case — and in the majority of cases — properties about objects are contingent.

The conclusion of Kripke's modal argument is therefore that, unlike a definite description, "a proper noun in modal context creates no ambiguity"(Drapeau Contim 2006, 41). We must therefore conclude that proper nouns and definite descriptions do not play the same role in the act of reference. It will thus be necessary to find a semantic element to separate and differentiate nouns from descriptions, which

Kripke will propose with his defense of the rigidity thesis for proper names and natural kinds terms.

2.7 The epistemic argument

In *Naming and Necessity*, Kripke opposes another category of decriptivist family: the descriptivism of singular term reference. The starting point of the objection is about epistemology, i.e. the way to arrive at knowledge. Kripke formulates (T5) as follow: let's take a speaker *L* "The statement 'If *X* exists, then *X* has most of the φ's' is a priori true for *L*". To show that this argument is false, consider the following (obviously true) sentence

If the *F* exists, then the *F* is *F*

If we take the description *F* to be "the author of the incompleteness theorem", then it is tautological to say that the author of the theorem is the author of the incompleteness theorem. If descriptivism is true, we are able to associate a proper name *n* (a singular constant) with the corresponding description, as follows

It is knowable a priori that if the *F* exists then *n* is *F*

To demonstrate the difficulties of this thesis, let's use the description "the author of the incompleteness theorem" to refer to Gödel and formulate two things about him

(10) It is knowable a priori that if the author of the incompleteness theorem exists, then the author of the incompleteness theorem is author of the incompleteness theorem **(analytic truth) - true in virtue of logical laws and the meaning of the sentence**

(11) It is knowable a priori that if the author of the incompleteness theorem exists, then Gödel is the author of the incompleteness theorem.

The problem appears with (11) because we can perfectly imagine that another person, for example Schmidt is the author of the theorem. Discovering a theorem is a contingent fact. In the history of our world, the theorem could have been discovered by another person, or not discovered at all. Consequently, we can neither necessarily nor independently of experience attribute a theorem to an individual. What's more, although mathematical theorems take abstract objects as their study, i.e.

objects that exist independently of space and time, the act of discovering the theorem is empirical.

Consequently, the descriptivists' argument is false, because we cannot a priori attribute a discovery to an individual. Moreover, scientific discoveries, like discoveries in general, must leave room for the possibility of error. Perhaps we were mistaken in attributing this discovery to Gödel, perhaps the discovery came from another individual. Nevertheless, if the individual we're referring to is indeed the author of the theorem, we can't know it by an a priori process.

To answer the question of how we can determine the reference of a proper name or a natural kind term, Kripke will propose in the second lecture of *Naming and Necessity* the causal theory of reference, according to which objects have their reference determined by an initial baptism and a name-acquisition transaction through the linguistic community that will help explain the way in which individuals make reference.

Chapter 3 :

Direct reference theories

3.1 - Presentation of the chapter :

In this chapter I would like to examine the answers provided by a new philosophical trend starting in the 1970s with the seminal work of Saul Kripke, Hilary Putnam, David Kaplan and others. As I will show, these philosophers have in common the idea that there are terms in natural language that are "authentically referential[11]". This type of referential terms — singular terms — have been the subject of various theories, including theories on proper names (Kripke 1980), indexicals (Kaplan 1978, 1989) and natural kinds terms (Kripke 1980 and Putnam 1975)[12]. I'll start by outlining the foundations of the theory of direct reference thanks to the theory proposed by Stuart Mill in the book *A System of Logic* (1843). I will then examine in greater detail the two major theses of Kripke's theory: the rigidity of singular terms and the causal theory of reference. To conclude, I'll look at some of the difficulties posed by the theory, particularly with natural kinds terms. In particular, I will examine an argument proposed by Helen Beebee for chemical kinds against the necessary a posteriori and one proposed by Samir Okasha for biological species against Kripke's essentialism.

3.2 - The roots of the direct reference theory: the Millian conception of proper names

Stuart Mill sets out his theory of singular terms in Chapter II of Book I of *The System of Logic* (1843). The starting point of his analysis comes from a distinction between two semantically distinct categories of terms: on the one hand, there is what Mill refers to as a "General noun", and on the other, "the Individual or Singular noun". In the contemporary literature devoted to theories of reference, an individual noun is what is known as a singular term, i.e. a term that refers to only one object. In

[11] This label is due to Kaplan's work on indexicality.

[12] In this chapter, I will concentrate on proper names and natural kinds terms. I will discuss indexicals in the chapter devoted to two-dimensional semantics.

the philosophy of language, there is a wide variety of singular terms: there are personal pronouns such as 'I', adverbs of place and time such as 'here' and 'now', definite descriptions such as "Christelle's daughter", but the paradigmatic example of a singular term is the proper name. The function of a proper name is to refer to a specific entity. This is true of a city, for example 'Geneva', of a country 'Switzerland', but also of individuals 'David Lewis'.

On the other hand, we have names that Mill refers to as general names, also known as general terms. Unlike singular terms, general terms are predicates in the logical sense, i.e. their function is to attribute properties. Moreover, general terms can refer to a plurality of objects. For example, the term 'man' is a general term in virtue of the fact that it can apply to several objects, say Socrates and Plato. Furthermore, a general term designates a *class of objects*. Mill defines a class as "the indefinite multitude of individuals designated by a general name" (Mill 1843, 27).

This fundamental semantic distinction between singular and general terms gave rise to the Millian thesis about proper names. According to the Millian conception, general terms possess two distinct types of semantic properties: *connotation* and *extension* (which Frege calls 'denotation' or 'reference'). The connotation of a term is the set of properties that the term expresses, and which constitutes the necessary and sufficient condition for inclusion in its extension. The term's extension designates the set of objects that satisfy the properties connoted by a term.

To satisfy the expressed properties connoted by a general term, the object must satisfy a set of conditions that are *individually necessary* and *jointly sufficient* to be part of the extension. For example, the term 'bachelor' connotes the properties "to be an adult person" and "to be unmarried". Each of these properties is a *necessary condition* for inclusion in the term's extension. Indeed, if an object doesn't have one of these properties, then it's not part of the extension. Furthermore, to be included in the term extension, the various conditions must be satisfied in a jointly sufficient manner. This means that if an object satisfies all these properties, then it is single. According to Mill, it is the connotation of a general term that explains its denotation. If the term 'bachelor' denotes the class comprising a certain number of people { a, b, c, ... }, it's because these people satisfy the properties connoted by the term.

3.2.1 Extension without connotation for proper names: the "Dartmouth" case

The central thesis developed by Mill and of interest to Kripke essentially concerns singular terms, and more specifically proper names. In the rest of the chapter devoted to names, Mill develops his central thesis, according to which "Proper names are not connotative; they designate individuals, but they do not assert, do not imply attributes belonging to these individuals" (Mill 1843, 33). To demonstrate this, Mill uses the example of the proper name 'Dartmouth', designating a locality in south-west England. The town lies on the banks of the coastal river Dart.

Mill's argument against the idea that proper names possess connotation is as follows: if the name 'Dartmouth' had connotation, it would certainly be the property of *being located at the mouth of the Dart*. Indeed, if the proper name really did have a connotation (in addition to its extension), this would imply that it would be part of the essence of the locality - that is, part of what makes the locality what it is - to be located at the mouth of the Dart. On the contrary, Mill argues that the fact that this town is actually situated at the mouth of the Dart is not linked to the fact that the name connotes something.

We must therefore conclude that a condition such as "being located at the mouth of the Dart" for a proper name has no referential role. Connotation is a property that has a referential role, that determines what we're talking about. Given that proper names don't connote anything, their function is precisely that of making reference.

3.2.2 Implications of the Millian theory of proper names

The Millian theory of proper names implies a model of *direct reference*. In "Afterthoughts" (1989), David Kaplan defines the theory of direct reference from the concept of "directly referential expression".

According to this conception, this literally means that "the relation between linguistic expression and referent is not mediated by the corresponding propositional component, content or what is said. It could also mean that nothing intervenes in the relationship between the linguistic expression and the individual" (Kaplan 1989, 568). If Kaplan's analysis is correct, this implies that referential expressions whose function is to determine a single referent, such as proper names, will differ radically from another category of expressions that are also supposed to refer to a single individual: definite descriptions. A definite expression is one that begins with a

definite article, such as "the". The semantic and grammatical function of this article is to select a single referent. It is the article that triggers the presupposition that there is one and only one object.

The conclusion of the Millian theory is that proper names have no meaning, in the sense that they have no connotation. This point implies that the function of a proper name is just to refer to an object. In the Millien conception, proper names are *linguistic tags* whose sole function is to select and refer to an individual.

3.3 The starting point of Kripke's direct reference theory: the metaphysical and the epistemic

In *Naming and Necessity* (1980), Kripke proposed a revolution in the philosophy of language concerning the analysis of modalities. According to him, different categories were considered identical or interchangeable in particular to the Kantian conception of modality[13]. Kripke has several reasons for defending this idea. First of all, he considers that "a priori" and "a posteriori" categories are *epistemic notions* whereas "necessity" and "possibility" are *metaphysical notions*. For Kripke, this distinction is fundamental because these two notions of necessity actually refer to very different things. In fact, It's important to emphasize a classic point about the nature of modalities. On the one hand, modal categories correspond to the *truth conditions* of a statement. This answers the question: how is this statement true or false? Is it necessarily true, contingently true, or only possible or impossible? Epistemic categories, on the other hand, correspond to the *conditions of justification* of a statement. They designate the *way* in which we know that a statement is true or false: either a priori , through pure reflection on concepts, or a posteriori, through empirical investigation.

Moreover, other authors such as Engel (1986, 88) argue that just because an object possesses a certain number of necessary properties, these properties should not be known independently of experience. and it works both ways: the fact that we know a priori a certain number of properties of the referent of the name 'Aristotle' does not imply that these properties are necessarily true. As I pointed out with Searle's analyticity argument and Kripke's modal argument, it doesn't seem possible to assign a definite description to a referent (as a general rule) because the property expressed by the predicate is never necessary. According to Kripke, a statement is necessarily true when the truth it expresses is valid in all possible worlds where the object exists.

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[13] For more on this concept, see my chapter 1.

To answer the problem of differentiating the semantic role of names and descriptions, Kripke proposed to defend a thesis that today constitutes a paradigm in the philosophy of language: the thesis of the rigidity of names, which is the first of the two fundamental theses of the theory of direct reference.

3.4 What is rigidity?

Rigidity is a semantic property of referential terms. The rigidity thesis is introduced by Kripke to solve the identification between necessity and a priority problem, defended by Russell. Indeed, if a name is a rigid designator, this means that it refers to the same object in all the worlds where it exists. For example, the name 'Aristotle' refers to *this particular man* Aristotle in all possible worlds where he exists, or, more precisely, in all the worlds in which it could have existed (because the same object cannot exist in two possible worlds at the same time)[14]. What are possible worlds? In *Naming and Necessity*, Kripke defends the idea that possible worlds can be understood as counterfactual circumstances.

Thanks to the introduction of rigid designation in order to explain the mechanisms by which a proper name refers to its bearer, Kripke distinguishes two things: on the one hand, natural language terms that are rigid designators and on the other hand terms that are non-rigid expressions. More precisely, Kripke considers two senses of rigid designators: rigid designators and "strongly" rigid designators. What does this distinction mean? First of all, the definition of with what I'll call "standard rigidity" and with the "stronger" view of this concept is the fact that the first one is relative to objects whose existence is necessary, whereas the ordinary application of the concept of rigidity applies to objects whose existence is only contingent. What does it mean for an object to have a necessary existence, and what are these objects?

In the language of modal logic and the metaphysics of modality, to say that an object necessarily exists is to say that this object exists in all possible worlds. But to explain what it means to "exist in all possible worlds", you have to give conditions, otherwise the explanation is circular. There are different types of modalities which differ according to the subject being dealt with: the use of modality can be conceptual, logical, physical or metaphysical.

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[14] It's important to make one point: this semantic thesis has implications for the metaphysical position we defend regarding the identity of individuals.

Let's focus solely on the logical and metaphysical use of modalities, giving a definition of what these concepts mean (at the level of object properties). Let's take the following statement:

(7) 2 + 2 = 4

This statement is a mathematical truth. Logical and mathematical truths are necessary because "they must be inferred from the axioms of the relevant axiomatic theories, on the assumption that these axioms are *consistent*" (Harsanyi 1983, 167). In all possible statement (7) is true because of logical laws. There can be no possible world in which this statement could have a different result. This category of statements are called "eternal statements", i.e. statements whose truth is insensitive to the context of enunciation by opposition to "indexical statements" which are "context-sensitive statements" like linguistic expressions such as 'I', 'here' or 'now', which vary according to the person, place or time of utterance.

The other aspect of rigidity, which I've called "standard rigidity" corresponds to objects whose existence is not necessary but contingent. We say of an object, fact, states of affairs or event that its existence is contingent, if it is the case but could not have been the case (and vice versa). Let's take different examples:

(8) If my parents had decided not to have children, I wouldn't have existed.

(9) The French Revolution might not have happened

Statements (8) and (9) express contingent things about the world. The personal pronoun 'I', which can be identified with my own name 'Brieuc Tulou', refers to an individual, myself. Since the event mentioned in (8) is contingent, this means that the proper noun is a rigid designator in the ordinary or weak sense.

All these examples are contingent; the order of the world could have been such that all these things would not have happened. It is because these examples convey contingent truths that nouns are designators in a weak sense. This shows that not all language expressions are rigid, to convince ourselves, let's take an other example, one concerning a proper name:

(10) Aristotle is the author of *Parts of Animals*

Proposition (10) is a definite description, because we are applying the property of *being the author of Parts of Animals* to Aristotle. Given that we have distinguished with the modal argument the semantic role of nouns and descriptions, then we can say

that the description is not rigid by virtue of the fact that we can always imagine a counterfactual circumstance in which Aristotle would not be the author of the treatise.

3.5 The causal theory of reference

By incorporating the idea that proper names are rigid designators, Kripke raises afresh the question of how we can fix a name's reference. In Russell's descriptivism, the referent of a name was fixed by a singularizing description. Given Kripke's modal argument that a proper name cannot be reduced to a description, we must try to answer the question of how a name's reference is determined and then transmitted.

The various arguments introduced by Kripke in *Naming and Necessity* allow us to conclude several things about the notions of sense and referent. First of all, you can't paraphrase a proper name with a singularizing description. This implies that we cannot know *a priori* from the use of a certain name ***N*** that the individual who bears it possesses this or that singularizing property. In addition, all the facts about these entities express contingent rather than necessary properties of the object to which the name is applied. The conclusions against descriptivism are the following: if we consider the two statements 'If *X* exists, then *X* has most of the φ's' is known a priori by the speaker' and 'If *X* exists, then *X* has most of the φ's' expresses a necessary truth' are both false.

Kripke's new objective is to account for the way in which a name's reference is fixed. Indeed, the notion of rigid designator is the starting point of the explanation, because it is thanks to this idea of direct reference that Kripke will be able to explain the way in which we can refer to objects. I'm now going to tackle the question of how the reference is determined and transmitted.

3.5.1 Putnam's causal theory

The context

Putnam's motivations for developing a causal theory[15] are quite different from Kripke's. According to Tiercelin (2013), Putnam formulates a theory to oppose relativism in the philosophy of science (i-e: "the view that truth and falsity, right and wrong, standards of reasoning and procedures of justification are products of differing conventions and frameworks of assessment and that their authority is confined to the context giving rise to them" (Baghramian and Carter 2020) and defend the idea that to fix the meaning of terms, we need to focus on the external world and not on our thought content, which would be "in the head" (Putnam 1975). I will show that this idea is of paramount importance in the analysis of natural kinds.

In this paper, the background of the discussion is to criticize the Fregean theory of sense and reference. Let's summarize the theory: according to Frege, a singular term (say, a proper name) refers to its bearer *via* a mode of presentation. According to Fregean theory, sense determines reference. While the proper name and the object are "objective" in the sense that they are public, the mode of presentation is "subjective" in the sense that two language users can refer to the same object through different properties. According to Putnam, even if Frege's starting point was to defend psychologism as false, and he himself defended a form of psychologism because "he identified concepts (and hence "intensions" or meanings) with abstracts entities rather than mental entities (Putnam 1973, 700). In this paper, Putnam has two goals, but I'll focus on the first one: knowing the meaning of a term is cannot be reduced to being in a certain psychological state. To do this, I'll explain Putnam's arguments using the Twin-Earth Experiment.

3.5.2 Twin-Earth experiment

Whereas Kripke set out his theory starting with proper names, Putnam's analysis focuses essentially on another kind of singular term: natural kinds terms. It's generally accepted that every science has an object of study, and that object of study is a particular species. For example, a part of biology studies plants, another for animals and it is even possible to focus on a particular species, such as birds, studied by ornithologists. Each science has a different object of study: in chemistry you can

[15] Putnam devoted two famous articles to the question of the causal theory of reference. The first one is "Meaning and Reference" (1973) from a conference and the second one is "The Meaning of 'Meaning'" (1975).

look at elements and compounds etc... Each of these sciences has its own code, called "nomenclature", which enables us to identify a species and distinguish it from others. Finally, it's important to mention that not all properties studied in science have the same status. Some are constitutive of the species in question (in the wake of metaphysicians, I would say that a constitutive property is essential), while a property that is not constitutive is accidental.

On the one hand, a property is essential to an object if it is part of the nature of that object, in other words, if that property is a condition of the object's existence. On the other hand, if a property is not part of the nature of the object (if it is not constitutive), then it is accidental. This distinction between what is essential and what is accidental is at the heart of Putnam's argument in the article.

Let me sum up the experience: there are two planets: Earth (our planet) and Twin-Earth (a fictional one). Given the similarities between these two planets, we can say that they are qualitatively identical.They are similar in all respects, but do not form a single object. One of the differences between these two planets lies in the way they describe their objects. On Twin-Earth, the liquid with the molecular formula H_2O has another formula in the form XYZ. From a phenomenological perspective, H_2O and XYZ are indistinguishable. The questions raised by Putnam is the following: what is the extension of a natural kind term and how to determine it? According to this view, there is no problem to consider the two following statements "On Twin-Earth the word 'water' means XYZ" and "On Earth the word 'water' means H_2O" because the natural kind term 'water' just have two different meanings which depend on the context.

3.5.3 The sociological hypothesis

Now let's look at the speakers' beliefs rather than mundane facts as Putnam puts it in the following passage (Putnam 1973, 702):

> Let's $Oscar_1$, be such a typical Earthian English speaker, and let $Oscar_2$ be his counterpart on Twin-Earth. If you like, you may even suppose that $Oscar_1$ and $Oscar_2$ were exact duplicates in appearance, feelings, thoughts, interior monologue, etc. Yet the extension of the term 'water' was just as much H_2O on Earth in 1750 as in 1950; and the extension of the term 'water' was just as much XYZ on Twin-Earth in 1750 as in 1950.

This passage shows that even if two speakers are in the same mental state but in different environments, this implies that the mental state in which a person finds

himself is not the element that fixes and determines the extension of a natural kind term. In addition, the fact that to call differently the same substance may be due to the linguistic community to which we belong. This point, that Putnam calls "division of linguistic labor" is important to account for the way in which a term's extension is fixed and its referent transmitted throughout the linguistic community. One of the important ideas developed by Putnam and Lowe is that you don't have to be an expert user of a name to be able to refer to a particular object, whether it's a person or a natural kind. Let's consider two examples: Aristotle and gold.

Aristotle is a man who is far from me in a temporal sense. I have no perceptual connection with him because I haven't met him. Nevertheless, I can refer to this individual through his name 'Aristotle' and and I can know him by virtue of certain properties I attribute to him. How is this possible, given that I've never been in contact with him, and how can I even know anything about him? To explain how can I know some properties or characteristics about an object with which I have never been in direct contact, Putnam justifies this type of knowledge by the fact that there is a certain link between him and me, and that this link is constituted thanks to the linguistic community. Putnam takes the example of gold, which is important because it's a natural kind: gold. According to this view, there is a division between people who are *expert* of the name 'gold' and people who are just *common users* of this term. People who are expert of the name are individuals for whom gold is their object of study or work. For example, a jeweler or chemist will be more expert on gold than someone wearing a gold ring or necklace. But if such a division of labor is present, we need to provide a criterion for separating those who *know* what gold is, from those who simply use it. The same applies to most names, whether proper names or natural kinds terms. When can a user of a name be considered to truly know the meaning of a term? Putnam separates two things to answer this question. If someone knows a term like 'gold' but that it is impossible to differentiate it from a similar kind, say iron pyrite, then it is part of a "subclass" of individuals which, although not an expert on the object to which the name refers, is linked to it through the use of the name. Nevertheless, Putnam concludes from this example that it is not necessary to be an expert user of the name to know its meaning. He mentions that "The features that are generally thought to be present in connection with a general name —necessary and sufficient conditions for membership in the extension, ways of recognizing whether something in the extension, etc.— are all present in the linguistic community *considered as a collective body*; but that collective body divides the "labor" of knowing and employing these various parts of the "meaning" of 'gold'" (Putnam 1973, 705).

If this idea is true, we can make the assumption that the difference between expert and non-expert users of a name returns to the difference between vernacular and common usage for a kind term to this division of linguistic labor. Let's consider water. 'Water' is a term referring to a substance that we use frequently in ordinary life: we drink water, swim in lakes made of water etc… There are other ways to characterize water, for example, if I say that water is a "chemical compound", that this chemical compound has "the molecular formula H_2O". These two last properties give us the scientific rather than the vernacular use of water. Thus, a person who knows the molecular formula of this compound is more of an expert than one who does not.

Therefore, if all linguistic communities are divided into expert and non-expert users of general terms, and the way to come to know the meaning of a term is through a process of "cooperation" between experts and non-experts, then we can conclude that what determines the extension of a term is not what's "in the head" (individual psychological states) but "it is only the sociolinguistic state of the collective linguistic body to which the speaker belongs that fixes the extension" (Putnam 1973, 706).

3.5.4 What's special about natural kind terms?

In the very last part of the paper, Putnam proposes to compare two theories about the meaning of 'water'. Let's consider two possible worlds W and W_1: in the first possible world, the glass is full of H_2O, and in the second one, the glass is full of XYZ. The first theory maintains that natural kind terms are *world-relative but with the constancy of the meaning* whereas the second one maintains that 'water' doesn't have the same meaning. To determine which theory is better able to answer this question, Putnam sets out the two theories more formally as follows (Putnam 1973, 707):

(1) (For every world *W*)(For every *x* in *W*)(*x* is water ≡ *x* bears $same_L$ to the entity referred to as 'this' in *W*)

(2) (For every world *W*)(For every *x* in *W*)(*x* is water ≡ *x* bears $same_L$ to the entity referred to as 'this' *in the actual world* W_1)

According to Putnam, the second proposition is the right one. Indeed, if we use the demonstrative 'this' to refer to water, the use of the demonstrative is *de re*, i.e. the demonstrative points to the object to which the term 'this' refers. The problem for (1) is that the entity to which we refer is within the variable "for every world *W*" whereas the entity referred to in (2) is outside the variable "For all world *W*".

Consequently, the second theory is the correct one, because it is the only one to assert that water has its reference set independently of other possible worlds, but instead has its reference set solely by the actual world.

In the wake of the theory of rigid designation proposed by Kripke in *Naming and Necessity*, Putnam adds that there is a link between the rigidity of a term (i.e. the fact that a referential term refers to the same object in all possible worlds) and the rigidity of indexicals (whose reference is fixed according to the context of use, i.e. the relevant features of the utterance). When we make the following "ostensive definition", a definition based on perception like "*this* (liquid) is water", this kind of sentence validates theory 2 because the descriptive use of the demonstrative 'this' is based on the way in which the speaker of the expression has experienced the world. Consequently, this theory shows that the demonstrative is rigid and that this proposition is based on our experience of the actual world. We can therefore conclude that Putnam's theory maintains that "an entity *x*, in an arbitrary possible world, is *water* if and only if it bears the relation *same*L to the stuff *we* call "water" in the actual world (Putnam 1973, 708).

Kripke's theory of rigid designation and causal theories of reference do not, however, meet with consensus in the philosophy of science, and pose a number of problems at different levels: epistemic, metaphysical and semantic.

In the following section, I would like to examine an objection by Helen Beebee in her paper "On The Abuse of the Necessary A Posteriori" (2010), which constitutes a theory opposed to the necessary *a posteriori* and the causal theory of reference for the case of chemical kinds.

Now that I've clarified the distinction between rigid and non-rigid expressions, I'll examine an important consequence of the rigidity thesis that constitutes one of Kripke's major contributions: the necessary *a posteriori* which is an answer to the difficulties posed by Frege and Russell's theory of the cognitive value of identity statements.

3.6 The necessary a posteriori: from identity between proper names to identity between natural kinds terms

At the end of the second lecture of *Naming and Necessity*, Kripke analyzes a co-reference phenomenon between referential terms. Co-reference corresponds to the fact that two names refers to the same object. This analysis is a direct response to the problem of cognitive value that appears in Frege's paper "Sinn Und Bedeutung".

According to Kripke's view, the two statements "Hesperus is Hesperus" and "Hesperus is Phosphorus" differ in their respective meanings because although the names 'Hesperus' and 'Phosphorus' both refer to the planet Venus, the two statements express different truth. The first statement is tautological or analytic statement: a statement is analytic when the truth-value can be established independently of experience while asserting that the statement is necessary. In the case of a statement like "Hesperus is Hesperus" it is tautological: it asserts nothing more than that an object is identical to itself. In fact, it is necessary and known a priori. In contrast, Frege considers the second statement to be informative because it is (would be) empirically known and, in fact, contingent.

The difference between Frege's and Kripke's theories concerns the statement "Hesperus is Phosphorus". According to Frege's model between sense and reference, this statement must be established a posteriori to be discovered as true because the description about Hesperus ("the first heavenly body visible in the west the evening") and the description about Phosphorus ('the last heavenly body visible from the east in the morning). In other words, the planet Venus, a certain object, has been given two proper names and for each of these proper names a singularizing description.

For his part, Kripke supports the idea that proper names are rigid designators, i.e. terms that refer to the same object in all possible worlds. Since Kripke is opposed to Russell's descriptivism of the sense of singular terms, his interpretation of the statement will be different. In defense of his own theory, he states that:

The terms 'necessary' and 'a priori', then, as applied to statements, are not obvious synonyms. There may be a philosophical argument connecting them, perhaps even identifying them ; but an argument is required, not simply the observation that the two terms are clearly interchangeable. (1 will argue below that in fact they are not even coextensive-that necessary a posteriori truths, and probably contingent a priori truths, both exist.)

This thesis of the distinction between *modal* and *epistemic categories* has a considerable impact on the status of modality. Traditionally, philosophers of science considers that an empirical discovery is contingent and something that is known independently of experience (a priori) is necessary.

Kripke considers that identity statements between proper names and natural kinds terms are necessary a posteriori. The question of the necessary a posteriori is related to actuality (the actual world) and possibility (possible worlds). The question, then, is what criterion allows a current situation to change into another possible world? To answer this question, we need to look at the properties of the objects.

The world and the objects in it have a large number of properties. Some of these properties are more important than others in determining an object's identity. Properties are generally divided into two categories: essential and accidental. Without going into the details of the metaphysics of essence, a property (in Kripkean analysis) is essential to an object if and only if that object possesses the property necessarily, i.e. in all possible worlds in which it exists.

The question, then, is which properties are constitutive (essential) of an object, and how do we know this? To answer this question, let's give a minimal definition of essence in terms of metaphysical modality (necessity): a property φ is said to be essential to an object Λ if and only if Λ necessarily possesses φ, i.e. in all possible worlds where Λ exists, possesses φ. In contrast, if a property is not necessarily possessed by an object, then it is accidental. Let's take theoretical identities in science:

(11) Water is H_2O

(12) Cats are animals

(13) Gold is the element with atomic number 79

To defend the idea that theoretical identifications in science are necessary a posteriori, Kripke starts from the scientific method and the way we establish that a property is necessary or contingent. Indeed, to establish the truth that water is identical to the compound of formula H_2O, it was necessary to carry out experiments on this substance that we call "water". Kripke's thesis is that our current scientific theories imply that it is part of the nature of gold to be the element with the atomic number 79. Thus, by discovering certain properties that are part of the identity of the natural kinds water, i.e., by discovering what makes water what it is, scientists manage to empirically discover the essence of water.

Through this analysis, Kripke establishes that if a certain property is part of the nature of a certain natural kind, then this property cannot be a contingent or accidental property: the fact that gold possesses the property of having the atomic number 79 is therefore necessary. It's the same thing for biological species like 'cats', 'tigers' and so on…

The Kripkean model of essential properties asserts that a property is necessarily possessed by an object if the object possesses that property in all possible worlds in which it exists and vice versa. Therefore, since it is necessarily the case that gold

possesses atomic number 79, then this property is also essential to it. It is part of gold's constitution — or what it is to be gold — to have the atomic number 79.

Nevertheless, if we establish that there are essential properties on the one hand and accidental properties on the other, then one of the fundamental questions to be asked is how we can separate the properties that are part of the essence of an object from those that are possessed by the object in a purely accidental way? In the third lecture of *Naming and Necessity*, Kripke provides an answer to this problem by taking two statements about gold:

(14) Gold is the element with the atomic number 79

(15) The color of gold is yellow

As we have seen above, proposition (1) expresses a necessary truth about gold because in all counterfactual situations of possible worlds where gold exists, gold has this property. But the question is, in virtue of what we can say that gold actually has this property? To answer the question of whether propositions (1) and (2) express necessary or contingent truths,

To answer the problem of the essential-accidental distinction, Kripke proposes to test our modal intuitions by making an inference from the conceivable to the possible. According to this conception if it concevable is that (p) then it is possible that (p).

To answer the question of whether proposition (1) involves a necessary or a contingent truth, Kripke will propose a microessentialist argument, i.e. the thesis that "chemical kinds can be individuated solely in terms of their microstructural properties" (Tobin 2022). Proposition (1) thus expresses a necessary truth because (i) we have discovered empirically that gold is the element with atomic number 79 (ii) we know that it is in the nature of gold to be a substance and (iii) we know that in general the essence of a chemical kind lies in its molecular constitution. Nevertheless, proposition (2) express a contingent truth because it might be the case that gold was not yellow but blue, due to optic illusion.

Kripke takes similar examples in the analysis of essential and accidental properties at the level of biological species. To do this, Kripke takes the example of the cat by taking two propositions that are supposed to separate the essential and accidental properties of biological species. To do this, let us take propositions (3) and (4)

(16) Tigers are mammals

(17) Tigers are quadrupeds

In these two propositions expressing properties of biological species, Kripke argues that it is in the nature of cats to be mammals. Nevertheless, there is nothing contradictory in imagining that a cat is not a quadruped: indeed, if we imagine that a cat has a metastasis in one leg and that to save it it is necessary to remove that leg, that animal would still satisfy the predicate "being a cat" and it would still be identical to itself even though it could no longer satisfy the property of being a quadruped.

The conclusion that Kripke draws from his metaphysics is that phenomenal properties (i) are only contingent properties of natural kinds and (ii) they play no role in determining and discovering the essences of these natural kinds.

The problem with Kripke's theory is that it does not meet with consensus either among philosophers of biology or chemistry. In the next section, I would like to develop the debate about the compatibility between essentialism and contemporary biology.

3.7 Metaphysical and scientific debates about the essentialist program

The metaphysics of natural kinds studies questions about nature[16] of biological, chemical and psychological kinds. I would like to start about a problem concerning biological kinds and the theory of evolution.

As we saw with Kripke, some object properties are essential, while others are accidental. Those that are essential are fundamental in determining the nature of a given object, species or substance. The first question I will examine is that of knowing if essentialism is compatible with contemporary biology? The essentialist model we will examine is that proposed by Kripke (1980) and Putnam (1970 and 1975).

The central idea of Kripke and Putnam's system is to propose the idea that knowledge of chemical and biological kinds is based on our modal knowledge. More

[16] In his 2024 "Natural Kinds" entry, Emma Tobin and Alexander Bird questions concerning natural kinds. Among these questions, we find the four main ones: First, are the kinds that we think of as 'natural' kinds genuinely *natural*? Or are our classification processes more anthropocentric than that? Secondly, are our natural kind classifications really classifications into *kinds*? Thirdly, what are natural kinds? Are natural kinds any sort of entity at all? Are they basic ontological entities or are they derived from or reducible to other entities (e.g., universals)? Fourthly, do natural kinds have essences?

precisely, this essentialist tradition maintains that theoretical identifications in science are necessary but knowable only a posteriori. Thus, the essence of chemical kinds lies in the molecular formula and the essence of biological species lies in the genetic code. The problem with this conception is that it does not seem compatible with contemporary biology.

In opposition to the essentialism of Kripke and Putnam, Okasha developed several anti- essentialist arguments in his 2002 paper, "Darwinian Metaphysics: Species And The Question of Essentialism". His goal was to show that Kripke-Putnam analysis are not compatible with contemporary biology. I will outline the main features of the theory that Kripke proposes in *Naming and Necessity* about natural kinds. In the second section, I present Okasha's anti-essentialist program.

3.7.1 Essentialism and the necessary a posteriori

Earlier in this chapter, I explained that certain statements between terms are both necessary and only knowable with experience (*a posteriori*). For example, when people discovered that the writer who had won the Goncourt for *Les Racines du ciel* was the same one who had won the prize for *La Vie devant soi*, i.e. Romain Gary alias Emile Ajar and concluded that Romain Gary was the same person as Emile Ajar. People have had to experience the world to know that this statement is true. Moreover, given that Gary and Ajar are the same individual and that 'Gary' and 'Ajar' are co-referential terms designating the same individual, then the statement is necessarily true but knowable only through experience of the world.

It's the same story for discoveries in the natural sciences: biologists observed animals and made classifications (biological nomenclatures) dividing nature into several natural genera: animals, plants, and so on. Chemists have also developed chemical classifications and nomenclatures to divide chemical elements and compounds. Among the properties of chemical kinds and biological species, there are those that are part of the essence of the object, i.e. properties that set a kind apart from others.and properties that are only accidental and not necessary to the object's existence. Statement (16) expresses an essential truth because it is metaphysically necessary — i.e., in all possible worlds where tigers exist — they are animals. Nevertheless, it's not essential for the tiger to be a quadruped, because we can imagine a situation in which a tiger would be tripod without contradiction. Consequently, the number of legs does not enter into the essential definition of what a tiger is, i.e. its category.

The same kind of conclusion applies to a chemical substance like water. It's part of its nature to be a chemical compound, and that its molecular formula is H_2O is essential. Nevertheless, water could have other properties such as a different color, a different flavor and so on. These properties, which could have been different from what they are now, are therefore by definition contingent and accidental. They are not part of what water is.

3.7.2 Okasha's anti-essentialist critique

In his 2002 paper, Okasha outlined a number of criticisms of Kripke's metaphysics of natural kinds and essentialism, the thesis that there are essences in nature. The starting point of Okasha's critique is that the essentialism defended by Kripke and Putnam cannot be applied to the case of biological species. Okasha's anti-essentialist argument aims at showing that essentialism 1/ does not apply to biological cases, but he defends a stronger thesis that 2/ this model is incompatible with contemporary biology.

Let us divide Okasha's argument into two phases: first the negative phase and then the positive phase. Nevertheless, whatever essentialist hypothesis we suggest, these do not provide any guidance as to what ontological status we should accord to natural kinds.

To show that the theories of Putnam and Wiggins are wrong, Okasha takes the example of the genetic code of the lemon and shows that the thing to which we refer with the term 'lemon' must be analyzed as an individual and not a kind. For biological species, Putnam's theory maintains that it is the genetic code of a biological species that delivers its essence. Therefore, this theory gives its limits from the moment we consider natural species as kinds and not individuals because we could not define a distinction between a lemon and an orange. Putnam's theory implies that we cannot differentiate one from the other by virtue of the fact that the genus Citrus has several subcategories of fruits such as orange, lemon or grapefruit. To develop the objections, Okasha takes up a traditional distinction concerning two distinct forms or categories of essence: individual essence (see, e.g., Wiggins, 1980) and species or kind essence.

Individual essence refers to the essence posed by particular individuals, whereas kind essence refers to the properties whose possession is necessary to be a member of a certain kind. For example, the property of being a man expresses a general essence

because many objects fall within the extension of the predicate 'man' (e.g. Socrates, Plato, Kripke…)

Since the work of Kripke and Putnam, several essentialist models, such as Bird and Tobin (2023) model have been developed. According to this conception, for each kind *K*, it exists a property Φ that is essential to *K*, such that all and only things possessing Φ are members of *K*. In one such example, Putnam (1975, 240) argues that the essence of lemonhood is the possession of lemon's genetic code. It is important to note that particular lemons do not necessarily possess the lemon's genetic code. Okasha argues that both conceptions of essence are logically independent, whereas Bird and Tobin (2023) find it difficult to believe that species essence could exist without individual essence.

However, we need not resolve this issue here as we are only concerned with the kind's essence theories proposed by Kripke (1980) and Putnam (1975). Kripke and Putnam assume that essential properties of kinds are intrinsic properties possessed by the members of the kind. Such intrinsic are not easily phenomenal properties, but microstructural properties discovered through scientific investigation. The essence of gold, for example, lies not in its visible properties of yellow color or malleability, but in gold's atomic number 79, which has been discovered empirically through scientific investigation. An essentialism à la Kripke and Putnam would proceed as follows: a biological species would have a set of essential properties, the possession of each of these properties would be necessary, and the possession of all of them would be sufficient for membership of the kind (see Hull, 1994). It is important to note that essential properties play two roles in Kripke's and Putnam's accounts.

First, they explain the reference of genus terms: when 'gold' is pronounced, it refers to the entity with atomic number 79, even before the concept of atomic number was posited[5]. Second, they explain the reference of genus terms to the entity with atomic number 79. This is the semantic role. Second, they causally explain the surface property possessed by the genus. The microstructural properties of gold (e.g. its atomic number) explain the yellow color, the malleability, ... of each gold sample. This is the causal-explicative role.

Okasha defends himself by saying that this explanation does not seem to work. It does not work because biological species simply do not work as such. This is because (i) there is too much genetic variation within a biological species and (ii) there is too much genetic similarity between different biological species. It is important to see

that there are no properties that would systematically escape genetic variation, so that variation could be seen as involving only accidental properties and not essential properties. Darwin's principle of natural selection in fact implies variation within species, without which adaptation of species could not take place. Thus, it seems that Kripke and Putnam's view of the essence of genus cannot work when applied to biology.

Okasha argues that, although their view is wrong as it stands, Kripke and Putnam's view can be salvaged if one is willing to abandon the following two ideas: the idea that intrinsic properties are necessarily the essential properties of a genus and that essential properties causally explain the surface properties of genera.

3.7.3 Theoretical remarks

Despite a significant set of criticisms of Kripke and Putnam's essentialist model, Okasha argues that their respective theories are not entirely wrong.

Although Okasha rejecting their central thesis that it is the genetic code of a biological species or the molecular formula of a chemical substance that allows for the essence of a chemical or biological species, he argues that we can defend the Kripke-Putnam conception if we argue that it is phylogenetic classification - that is, a taxonomic classification work establishing the relationships between individuals, by asking about ancestors - that will allow us to determine which members are part of which species, and not a mysterious essence. Therefore, Okasha asks whether, with the argument developed above, then the Kripke/Putnam model of natural kinds be salvaged in its entirety for biological species, simply by replacing their "hidden structure" with whatever relational property we take to determine species membership? The answer to this problem is negative: according to Okasha, one cannot use any relational property to make an individual part of a species for two reasons. He explains that "there is no a priori reason why the same thing should play both of these roles. It is perfectly possible that the extension of a kind term should be determined not by superficial characteristics but by 'something else', just as Kripke and Putnam say, without it being true that 'something else' causally explains the presence of the superficial characteristics" (p. 203).

In this argument, the basic idea is to show that it is not contradictory to argue that the reference or extension of natural kinds terms is fixed by virtue of contingent or accidental properties of a species while at the same time defending the idea that what is essential to a biological species, like the genetic code or the molecular formula for

chemical kinds, explains why such and such a species has certain specific essential properties. Thus, it is perfectly possible to argue that the reference to the species term "tiger" is fixed at least in part by the color of the coat or the fact that the tiger has the property of being a quadruped. Nevertheless, these superficial properties are not responsible for what makes the tiger what it is, i.e., what fixes and determines the identity of the tiger. What makes the tiger what it is, and what distinguishes it from other subspecies of the same genus as it (the felid species) is its internal constitution, which is unique to it and which allows it to be differentiated from other species.

3.7.4 Okasha's answer to the biological species problem

Okasha's proposed model against Kripke, Putnam, and Wiggins essentialism. Let relational properties be essential properties and argue that these properties might be individually necessary and jointly sufficient (as in Hull's definition mentioned above) for genus membership. Fortunately, modern definitions of species make use of relational properties. Indeed, the criterion for species delimitation may be the notion of interbreeding, or it may depend on ecological or even phylogenetic considerations. All of these conceptions of what a species is admit of limitations, but what is important is that these definitions, whichever one is ultimately correct (if any), allow Kripke and Putnam's account to work.

This can only work if there is a clear understanding of what a species is and what it is not. Now, this can only work if we abandon the idea that essential properties causally explain the superficial properties of genres. Indeed, if we use miscegenation properties as essential properties delimiting membership in a genus, we cannot argue that these properties causally explain surface structure such as phenotypic properties: an organism's ability to miscegenate cannot be causally responsible for some of its phenotypic traits.

Thus, Kripke and Putnam's account can make sense of the notion of biological essence provided that the idea that intrinsic properties are the essential properties for membership in a biological genus is rejected and the idea that essential properties should be involved in any causal explanatory mechanism between essential and surface properties is discarded.

One possible theory for reconciling essentialism with advances in contemporary biology is to argue that it is a relational property between members of the same species that will allow them to be classified within the same species. In sum, the Kripke-Putnam theory must be modified in substance in the following way:

fundamentally, we must say that the classification of kinds and the delimitation between kinds does not rely on essence, which Kripke and Putnam classify as the fundamental point of explanation. To defend a conception compatible with contemporary biology, it would be necessary that the criterion of identification of a biological species is not its genetic code but "its position in the tree-of-life, which is the real criterion" (p. 202).

In the following section, I'd like to examine an argument by Helen Beebee against Kripke's model of the necessary a posteriori and its metaphysical implications, but more generally of her conception of the way in which the reference of names is fixed in philosophy of language, with the causal theory of reference

3.8 On Beebee's objection about chemical kinds: the necessary a posteriori and the causal theory of reference

The starting point of Beebee's paper is the idea that the way in which Kripke establishes the necessary a posteriori is controversial in philosophy. In *Naming and Necessity*, he insists that "there is more in commonalities between proper names and natural kinds terms than is commonly thought". This idea already faces serious difficulties: in fact, when we formulate an identity statement between proper names such as "Cicero is Tully" and a theoretical identity like "gold is the element with atomic number 79", these two statements are necessary a posteriori truths but with some differences because the first one is just an association between two proper names referring to the same object whereas the second statement associate a natural kind term (similar to proper names because it's a rigid designator) and a rigid definite description. Consequently, statement 2 differs from 1 because the latter expresses an individuating property while the former only makes a singular reference thanks to two co-referential terms

In her paper, Beebee wants to show that "some particular cases of chemical and process kinds will demonstrate that there are at least some natural kinds that manifestly do not generate a posteriori necessities" (Beebee 2010, 164). To demonstrate this, she uses the example of the discovery of ununbium, whose essential property is that it is the chemical element with atomic number 112.

According to the *National Library of Medicine*, copernicium atom is a zinc group element atom with "the symbol Cn and atomic number 112". According to the Kripkean conception of scientific discoveries, that is, when we discover that a property is part of the essence of an object, then that property is necessary. Beebee

explains that IUPAC (International Union of Pure and Applied Chemistry) introduced a method for make reference to "temporary designators", which are used to name elements for which there is evidence they exist, but where that evidence falls short of conclusive proof. This method takes the following form: chemists introduce descriptors, i.e. words or expressions used to describe and identify a particular species. The name found for the element or natural kind is determined by scientific discoveries about the object. For example, the example refers to a chemical element with atomic number 112. This essential property — having *this* particular atomic number will determinate (at least partially) the kind term. In the *Nomenclature of Inorganic Chemistry*, Connelly and others explains that the origin of the names of chemical elements come from Antiquity.

Sometimes, the same element could be given two different names because two different scientific communities had the same object of study. The problem is that each chemical element has its own distinctive properties. So we need to find a way of naming each element according to its own essential properties. In response to these problems, IUPAC has proposed semantics and nomination practices specific to the discovery of chemical elements.

According to this method, the name is derived directly from the atomic number of the element using the following numerical roots (Connelly and al 2005, 47):

0 = nil	3 = tri	6 = hex	9 = enn
1 = un	4 = quad	7 = sept	
2 = bi	5 = pent	8 = oct	

Let's take the case of the naming of ununbium (copernicium). The first rule is that the name of the chemical element is derived directly from the element's atomic number according to Latin numbering. Since the Latin root of the number '1' is "un", the prefix is presented in this way. The second semantic rule to generate natural kind terms is to assemble the roots in the order of the digits that make up the atomic number. In addition, the element symbol is composed of the initial letters of the numerical roots that make up the name. These rules are used to generate chemical species names from 101 to 900. Thus, ununbium with atomic number 112 is symbolized as follows: Uub. The argument presented by Beebee and Sabbarton-Leary shows that through knowledge of chemical element naming practices alone, we can know a priori, through pure conceptual analysis and semantic knowledge, that the statement "ununbium is the element with atomic number 112".

The question we need to clarify is whether this practice of generating species names is satisfactory. If so, this means that it is not the "causal" (a posteriori) aspect defended by Kripke and Putnam that can account for the way in which the reference of terms is determined, but only by a semantic encoding, determined by rules of grammar (a priori).

To answer this question which boils down to asking which theory — descriptivism or the direct reference theory — is more competent to give a semantic of natural kinds in science.

I'm going to ask what the function of our scientific terms is: are they *descriptive* (expressing properties) and thus fixing the extension of the species, or are they genuinely *referential* terms like proper names?

3.9 Are natural kind terms referential or descriptive?

According to the descriptivist analysis, natural kind terms are *descriptive terms*, i.e. the function of a species term is to express properties that enable species and kinds to be separated by identification and distinction. Consequently, the reference of the term 'tiger' will be fixed a cluster of properties by the description "the carnivorous feline, 3 meters long, whose coat is striped with yellow and black, etc…" In contrast to this conception, the model defended by Kripke and Putnam defends that the reference of a kind term is fixed by ostension. In fact, the species of tigers designates a set of specimens of a certain type ***K***.

If we follow the model proposed by Beebee, who argues that we can fix the reference of a kind term through semantic rules, this implies that his conception comes close to descriptivism, considering that being ununbium is nothing more than satisfying the properties of being the chemical element that possesses the atomic number 112. As shown by the IUPAC model described above, we know that certain chemical elements (from 101 to 900) can be generated because the following rules apply. According to her own conception, "chemical names are *not* introduced using a Kripke-style name- acquiring transaction. Rather, they are generated using a complex set of rules and grammar, and clearly encode descriptive information. In other words, they are descriptors. As a result, a theoretical identity sentence such as 'ununbium is the element with atomic number 112' and 'trichlorido-phosphorus is PCl_3' is something a chemist can come to know *a priori*" (Beebee 2010, 165). Is this a satisfactory conclusion?

I would like to suggest a remark to this idea: without getting into the theoretical complexities of the causal theory of reference or the descriptivist, let's appeal to our shared intuitions about scientific discoveries. Does it seem satisfactory to consider that we could determine the essence of this or that kind simply by a logic determined by grammar? Scientific advances are, by definition, discoveries in principle, and so experience of the world has been required to attribute properties or essences to the objects studied. It seems, then, that if reflection is a component in the formulation of scientific theories about natural kinds, this "reflection" or "a priori process of reason" cannot be antecedent to our experiences of the world.

In addition, Beebee mentions difficulties with the model she proposes concerning the a priori nature of theoretical identities in chemistry (Beebee 2010, 166).

> The claim that 'ununbium is the element with atomic number 112' is knowable a priori entails that it could not be discovered to be false; however, this is disputable. Imagine, for example, that the element we were calling 'ununbium' turned out, long after the term had come to be widely used (and perhaps part of ordinary language because [what we had been calling] ununbium turned out to have properties that are important out- side the chemistry lab), to have 113 protons rather than 112 protons in its nucleus.

The argument advanced here takes up the idea that scientists can make attribution errors. As a result, the element we have designated with the property of having atomic number 112 could actually have 113. Therefore, to be sure that chemical elements - but objects in general - actually possess the properties we attribute to them, requires a process of verification through experience of these objects. In the example above, we don't mean that ununbium could have had atomic number 113, otherwise ununbium wouldn't be itself. We must therefore admit that knowing that ununbium possesses this property implies first and foremost the empirical character that is fundamental to science. Finally, if such a property is discovered to be currently attached to this object, and this property is essential to this object, i.e. it participates in its constitution, i.e. in what makes this object what it is, then this property is necessary. So, this hypothesis saves Kripke's necessary a posteriori.

Chapter 4 :

Modal conventionalism

4.1 - Presentation of the chapter :

In this last chapter, I would like to examine a philosophical theory that is at first sight opposed to the realism proposed by Kripke and Putnam: conventionalism. I will begin by introduce the background to conventionalism and some of its applications. I will then examine a contemporary conventionalist attempt proposed by Alan Sidelle in his book *Necessity, Essence and Individuation* (1989) to show how it is possible to defend the necessary a posteriori within a conventionalist perspective.

4.2 Conventionalism: the basics

When we talk about conventions, in moral philosophy for example, we like to define the concept in the following way: on the one hand, we can characterize conventions as an agreement between a group of people. In this context, it is clear that conventions are contingent because they arise from human decisions. On the other hand, we can analyse this concept of conventions as something imposed from outside: a person who believes in God might believe that morality and the conventions that flow from it are not created by men but imposed by a higher entity.

There are different versions of conventionalism, depending on the phenomenon to be studied[17]. The version I want to start with is a conventional theory of logical concepts: the uses of logical concepts and operator like negation, conjunction, disjunction, equivalence are determined by logical laws such as the principle of contradiction, which states that a thing cannot possess two contradictory fundamental properties: a geometric figure cannot possess both the properties of being round and being square. One of the problems with logical notions is that they draw on other fields of knowledge, such as metaphysics and epistemology. Metaphysics studies what is necessary, what is possible or what is contingent, and

[17] We can apply a conventionalist thesis to various philosophical concepts such as justice (Hume 1739), personal identity (Parfit 1984), mathematical analysis (1937)

epistemology studies what is analytic, what is known independently (a priori) or through experience (a posteriori). As Warren (2007) and Sidelle (1989) have argued the central idea of conventionalism is that the roots of some concepts like truth, analyticity and necessity are *grounded* in the conventions of the language. For example, a conventionalist account to establish that the truth of the statement "all bachelor are unmarried" is based on a compositional analysis of the statement, i.e. the truth of the whole statement is determined by its parts, and the meaning of each of its parts is determined by our particular uses of language. The conclusions we can draw from this approach is that natural language statements we use in everyday life are "conventional" or "established by convention" statements. By means of definitions and descriptions, language users associate a term with a property (or set of properties) that the referent must satisfy in order to appear in the term's extension.

According to this analysis, if I point to a certain man and say of that man "he is a bachelor", I can also describe him as an "unmarried man" because I defined beforehand that a bachelor *is* an unmarried person. It is the identity relation expressed by the verb 'to be' and by its occurrence 'is' that makes it possible to establish by convention the truth of the statement. Using referential semantics terminology, I can describe it in this way, i.e. identify the predicate 'bachelor' with the set of individually necessary and jointly sufficient properties 'to be an adult person' and 'to be unmarried' for this individual to appear in the extension of the concept 'bachelor', it is *because* there is a relation between the concept 'bachelor' and the predicate 'to be an unmarried person'. In this case, as soon as we identify the term with the predicate, we consider that this truth — established by convention — is analytic, i.e. necessary and a priori. It possesses these metaphysical and epistemic properties by virtue of necessity, because if a person is a bachelor, it's because he or she is necessarily unmarried, otherwise it would be a contradiction in terms. But this statement is also analytic because it is true by virtue of the meaning of the terms that make up the statement. Thus, the observation of similar cases of individuals possessing these properties can allow us to express a general statement such as "all bachelors are unmarried".

This "truth by convention" is considered as analytic, in the sense that this statement is "true by virtue of the meaning of the terms of which it is composed". According to this view, single *means* unmarried. The notion of "meaning" here can also be qualified as substitutable. One of the major difficulties with this conception is therefore, as we saw with Kripke, that we cannot differentiate between a statement

such as “a bachelor is a bachelor” and “a bachelor is an unmarried man”. Now, as we know, the former is trivial while the latter is informative.

How can the conventionalist account for these statements? Let’s take the statement “vixen is female fox”, this statement is assumed to be true by virtue of the meaning. Is it really the case? A first objection we can address to conventionalism is that if its theory were true, we wouldn't need to experience the world to establish a general identity statement like “all vixens are female foxes”. We could say that our conventions enable us to communicate information within the linguistic community, but that knowledge is based on experience.

A major problem for the conventionalist is how to explain that there are statements that express contingent truths, i.e. that are true but could have been false, if our conventions are analytic? An answer to this problem is to say that “we could say that the only sense in which synthetic truths *could* have been confuted in experience – the only sense in which our experiences could have been other than they are – is that our linguistic conventions don’t *rule out* our having such alternative experiences” (Cameron 2010, 137). It seems that a better option to answer in the first instance, is that worldly facts, in order to be recognized as necessary, involve experience because only experience can demarcate what is contingent from what is necessary. In this sense, conventions cannot *create* truths because the truths we establish by convention are based on our experience of the world. Secondly, we describe the world using our natural language terms, but only our linguistic usages are conventional because they depend on the users of the language, whereas facts depend on the world.

Before Kripke’s works about modal and epistemic categories, some conventionalists such as Ayer (1936) consider set out a conventionalism for analyzing the laws of logic and mathematics. More precisely, the relationship between the modal concept of necessity and the epistemic concept of analyticity is one of foundational. He says “I allow [logical and mathematical truths] to be necessary and certain only because they are analytic” (1936, 31). On Ayer’s view, analytic truths are necessary and synthetic truths are contingent because synthetic truths tell us something about our worldly experiences that could have been different. The version of conventionalism I would like to explore is the “crude conventionalism” (Cameron 2021, 138) which I will resume as follows : S is necessary iff it is analytic. According to this conception, any statement established by convention is necessary, and these “truths by

convention" are therefore explained by the compositionality of the statement, i.e. the truth value of a statement is determined by its parts. One of the major implications posed by this conception is that the concepts of necessity and a priority, which together form analyticity, are not extensionally equivalent.

The conventionalist is therefore faced with a problem: according to Kripke, there are necessary statements that are not analytic but synthetic, in the sense that 1/ they extend knowledge and 2/ can only be established through experience of the world. The conventionalist does not necessarily reject the necessary a posteriori, but maintains that these truths are determined by "analytic principles of individuation". I will therefore examine the problem of synthetic statements and Alan Sidelle's conventionalist response to it.

4.3 Sidelle's modal conventionalism and the problem of synthetic statements

The main thesis of Sidelle's modal conventionalism is that "necessity is nothing beyond analyticity" (Sidelle 1989, 2). According to this view, all analytic sentences — sentences which are true just in virtue of the meaning of its parts — are necessary. Sidelle's theory is therefore to oppose the idea that "modality is a real, mind-independent feature of reality" and the fact that truth are necessary because "the states of affairs they depict are, as a matter of the way the world is, quite independently of the ways we talk and think about them, necessary" (Sidelle 1989, 5).

First of all, Sidelle distinguishes two groups of necessary a posteriori truths: the (synthetic) identity statements between *two rigid designators* like "Hesperus is Phosphorus" and the statements which expresses essential properties about objects, for example that "water is H_2O" or "Margaret Truman is a biological daughter of Bess Truman". According to Sidelle, these propositions express necessary a posteriori truths in virtue of some "general principles of individuation" . Let's divide Sidelle's discussions in two parts, ***a posteriority*** and ***necessity***.

A posteriority: Statements about the origin of individuals must be experienced in the world in order to be stated and established as true or false. In the third lecture of *Naming and Necessity*, Kripke explains that the re are different contexte in which the discovery of essence is due to experience. He takes the example of the Queen to ask whether this person, this particular woman, would have been the same person if she

had been born of different parents? To answer this problem, let's give a minimal definition of the term 'parent', (even if the term 'progenitor' is more appropriate given that we are referring to the origin of an individual, which is caused by the reproduction of two individuals). The question, then, is whether an individual I could have existed (and been the same individual, from the point of view of digital identity) while being born of different parents? Kripke's answer is negative: anything coming from a different origin would not be this object. The fact that an individual I is in a certain relations *R* with a group of individuals of progenitors *G* is a necessary or essential fact in Kripke's theory. While certain counterfactual situations about an individual may be acceptable, such as imagining having lived in another country, this type of thing is contingent. Nevertheless, even if we accept that certain events in our lives could have been different, this is possible because the properties expressed are not essential but accidental. On the other hand, certain properties are constitutive of an object, and in this sense are essential or necessary to it. In the case of these properties, things could not have been (counterfactually) different from what is (actually) the case. Consequently, discovering that an individual or a species has a certain precise and determined origin is a fact that requires experience of the world. the same conclusion applies to the identity between co-referential terms. The identity between Hesperus-Phosphorus is necessary because the Babylonians' experiments in astronomy established that the celestial body visible in the morning was numerically the same as that visible in the evening. Consequently, they had just used two names because they thought they were two distinct entities.

Necessity: To find out whether these facts are necessary, let's turn to a notion commonly used by philosophers of language and metaphysicians, the notion of "counterfactual situation". A counterfactual situation (or possible world). is to examine whether a fact is necessary or merely possible. Let's consider the Gary-Ajar case. In 1975, the jury discovered during the award ceremony that Emile Ajar was none other than Romain Gary. From the moment this discovery is made, can we still say that Gary is not Ajar? That would be absurd. Therefore, if Gary is currently the same person as Ajar - not by virtue of converging descriptions - but by virtue of the fact that Gary possesses the property of being identical to Ajar then this fact is necessary or by virtue of essence. In all possible worlds where Gary exists, Gary is identical to Ajar.

The problem of synthetic necessities comes from the fact that the necessary truths "outrun any plausible list of analytic truths" (Cameron 2010, 138). Necessity,

analyticity and a priority are not extensionally equivalent, these concepts cannot be substituted as if they were interchangeable. If there are synthetic a posteriori truths, this is incompatible with the conventionalist framework: indeed, the conventionalist cannot account for the fact of knowing what generates (in experience) the necessary a posteriori truths.

If we want to formulate a neo-conventionalist analysis able to give an account of the necessary *a posteriori*, we have to propose a more modest analysis according to which the necessary of necessary truth must be *explained by* our linguistic conventions. In this view, conventions are the source of modality.

4.4 The introduction of the modal principle of individuation to respond to the challenge raised by the realist theory of a posteriori necessity

To give a theory of a posteriori necessary truths in the conventionalist framework, Sidelle introduces a "principle of individuation" (which is analytic) and whose function is to generate the a posteriori necessary truths. Before, he explains that we must start from the idea that for all necessary a posteriori truth, the negation of this truth should be *epistemically possible*. An epistemic possibility is something may be true, given the relevant epistemic constraints.

According to Sidelle, the fact that certain statement about the world are necessary a posteriori statements is explained by the fact that "For any necessary a posteriori truth, there will be epistemically possible situations in which, since the actual facts in those situations are different, what is necessary is different" (Sidelle 1989, 32) One of the main consequences of this conventionalist proposition is that, contrary to what Kripke's theory asserts, there is nothing to favor the fact that water is H_2O and not XYZ, other than the fact that H_2O is the chemical formula that water has in the actual world. How can we explain this? Are we ready to accept that water could have had another chemical formula than the one we know in the actual world?

The strategy is presented as follows: is that whatever the chemical structure of an element or chemical compound, it is required to be *that* element. Sidelle uses the expression "deep explanatory feature" to characterize what is essential for being a particular thing. According to Due (2018, 21), the key point is that "it's not superficial properties such as being clear or drinkable that are essential to water, but rather the

underlying physical properties that explain them; and, we know this a priori" is an individuation principle, i.e. a principle that can give the individual essence of this object (what medieval philosophers call "haecceities"). Let's formule with Sidelle-style the principle of individuation

Individuation principle : (*x*)(If *x* belongs to kind *K*, then if *p* is *x*'s *P*-property, then it is necessary that *x* is *p*

The *P*-property here can take many forms: the biological origin of an individual, the molecular formula of a chemical substance...

If we apply this principle to water, it takes the following form

Individuation principle WATER: For some substance to count as water, it must share the deep explanatory features of the substance that fills our lakes and rivers, whatever those features turn out to be

According to Sidelle, this individuation principle is analytic because a statement like "water is composed of H_2O molecules" is determined by the fact that "our necessary truth will be a posteriori because of the nature of our convention, which requires that it be supplemented by a posteriori matters of fact […] That water is H_2O is an empirical, worldly matter; that is *necessarily* H_2O would result from our conventions" (Sidelle 1989, 37).

According to this conception, we can give a conventionalist theory of the necessary a posteriori and the capacity to explain that necessity is grounded in conventions by a derivation from two things: an ostensibly non-modal statement like 'Water is a chemical kind' statement in which we associate a certain specific natural kind with the more general category to which that kinds belongs, that of *being a chemical element* + an essentially truth about this element that we have discovered in the actual world. Like Sidelle, we thus combine the facts about a specific kind and the microstructure of this kind, we can derive the modal statement "Necessarily, water is H_2O".

The fundamental difference between Sidelle's proposal and that of Kripke and Putnam lies in the fact that our association of the term 'water' with the description "necessarily being the chemical compound of formula H_2O" rests only on the way in which we refer to this object, even though it is necessary, as Kripke and Putnam

defend, for water to have such and such a specific formula. As he explains "the necessity of whatever is found out to be water's microstructure is given by convention, and is not something which is discovered. That water *is* H_2O is an empirical, worldly matter; it is *necessarily* H_2O would result from our convention" (Sidelle 1989, 37).

4.5 Objections to the conventionalist account

In 2019, Ross P. Cameron devoted an article to modal conventionalism and the possible objections to this position. According to him, the version defended by Sidelle, which he calls "sophisticated traditional conventionalism" can be summed up by the fact that: for every necessary truth, S, the necessity of S is explained by our linguistic conventions". As I explained above, this necessary determination is based on principles of individuation that are analytic in the sense of "true in virtue of meaning". The concept of analyticity used here is that defended by Kant in the sense that a proposition is analytic if it is necessary and a priori.

The starting point of the objection is to ask whether it is really the case that it is analytical. The fact that water has the molecular formula H_2O is something we have discovered empirically, so this type of statement would be synthetic a posteriori. Synthetic because it extends knowledge and a posteriori because only experience has enabled us to discover that this property does indeed belong to water. In other words, it is impossible to know a priori — without recourse to experience — that an element or a chemical compound has such and such a molecular formula or such and such an atomic number[18]. According to Sidelle, what we can know a priori is not that (i)/ water is H_2O but (ii) *if* water is H_2O, *then*, necessarily, water is H_2O. (ii) is analytic because this is an application of the identity necessity theorem in modal logic, according to which if a is identical to b then necessarily a is identical to b (if a and b are rigid designators). The purpose of Sidelle's theory is to show how we can preserve the truth (which is necessary a posteriori) of the statement "water is *necessarily* H_2O".

To do this, the argument includes the two following premises (Cameron 2019, 140):

[18] This confirms the objection made to Helen Beebee about the generation of the terms of certain natural kinds in chemistry: it may be possible to generate the names of species using grammar rules such as those of IUPAC, but discovering that the element has these properties is something that can only be established empirically.

(i) Water is H_2O (Synthetic/necessary a posteriori truth)

(ii) If water is H_2O then, necessarily, water is H_2O (analytic truth)

(c) Water is necessarily H_2O

One of the objections proposed against this model is as follows: it seems that we can question whether water has this structure in the most fundamental way: the discovery of the nature of a chemical substance or a biological species is the subject of constant discoveries in the natural sciences. In order to validate Sidelle's thesis, we would have to be able to know the properties of the species in the most ultimate way. What's more, defending that water is necessarily H_2O by means of a modal thesis about essence does not meet with consensus in contemporary metaphysics, particularly with the work of Kit Fine, who defends a non-modal theory of essence.

Another objection was suggested by Yablo (1992): the starting point of the objection is to suppose that "whatever water's ultimate structure, it has that structure necessarily" (Cameron 2019, 140). According to Yablo, but this in no way implies that the properties which are part of the essence of water are a matter of convention. In this regard, the case of water constitutes a perfect example to illustrate the difficulties of Sidelle's position: in fact, until 1901, scientists considered that the molecular formula of water was HO and not H_2O like we know it. If Sidelle's theory were correct, we would have to argue that the substance we called 'water' before 1901 should necessarily possess the molecular formula HO? It therefore seems difficult to argue that the necessary truths a posteriori are founded or can be explained by our conventions.

Of the two positions - realism and conventionalism - it seems that the realist version of the necessary a posteriori is the one best able to account for the way in which scientific discoveries are made and the way in which the truth of theoretical identification statements is explained.

Conclusion:

In this dissertation, I examined which semantic theory was best able to account for the truth of statements using singular terms: proper names, definite descriptions and natural kind terms. In order to answer this question, I have devoted my first chapter to examining three fundamental concepts (reason, meaning and modality). These three concepts, like the points of a triangle, give rise to relationships, the segments, that play a role in a theory of reference and modality. The Kantian theory of modalities and the Fregean theory of sense and reference were the two theories whose validity I questioned.

In Chapter 2, I investigated the validity of semantic and modal connections by developing Russell's descriptivist paradigm and Kripke's objections. Despite its elegance and the logical paradoxes that descriptivism can resolve, it seems to me that the problems that the theory answers are less important than the ones that it introduces, in particular the fact that it does not seem possible to defend a proper name can be substituted for a definite description.

In order to respond to the problems posed by descriptivism, I proceeded in two stages: the first, negative, consisted in rejecting descriptivism on the basis of Kripke's three major arguments: the modal argument, the error argument and the ignorance argument. I then developed a positive theory of nomination based on the theses defended by Kripke. The position defended is that there is a fundamental difference between proper names and definite descriptions: proper names, and more broadly singular terms such as demonstratives or natural kind terms, possess a specific semantic property (rigidity). which distinguishes them from ordinary definite descriptions. The rigid designation thesis (which states that a singular term is a rigid designator as long as it refers to the same object in all possible worlds where it exists) has implications for our ways of interpreting modal categories and epistemic. Kripke's main contribution to this field is that there are necessary a posteriori truths and contingent a priori truths. I also examined the causal theory of reference which allows us to account for the way in which the reference of terms is fixed. This sociolinguistic approach to reference has the advantage of being compatible with our real practices of naming and transmitting names in the linguistic community.

Finally, I have outlined some of the metaphysical consequences of Kripke and Putnam's position regarding natural kinds. It seems that contrary to the advantages of their semantics and which today form the orthodoxy in philosophy of language, the application of metaphysical theses on contemporary debates in biology and chemistry are not in agreement with their essentialism about natural kinds.

In my last chapter, I examined a challenge to the realist version of the necessary a posteriori through modal conventionalism defended by Alan Sidelle. According to this theory, the source of modal knowledge and necessary a posteriori truths is grounded in our conventions. This thesis — whose essential aim is to reconcile necessity and analyticity — to challenge the realist view about the necessary a posteriori does not seem to me to be able to respond to the difficulties posed by Kripke and Putnam's analysis because it implies that the properties which are part of the essence of objects are a matter of convention. Now, I strongly reject this point: indeed, we can debate the question of which metaphysical position is best able to discover the essence of a thing, in its most fundamental aspect, but answer it to this metaphysical question must be a metaphysical answer: what can explain that a property which is part of the essence of a thing is necessarily/or constitutively part of this object is an answer given by processes which appeal to the how we discover the world and not how we describe it.

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