A MODEL-THEORETICAL SEMANTICS FOR ILLOCUTIONARY FORCES

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By uttering sentences speakers perform speech acts of a type called by J. L. Austin (1956) illocutionary acts, e.g. assertions, requests, promises, apologies. Most elementary illocutionary acts are of the form F(P), where F is an illocutionary force and P is a proposition, and are expressed by elementary sentences of the form f(p), where f is an illocutionary force marker and p is a clause. By an illocutionary force marker I mean here any expression whose meaning determines that a literal and serious utterance of a sentence containing that expression has a certain illocutionary force or a certain range of possible illocutionary forces. Thus, for example, word-order and mood are illocutionary force markers in the sentence: "John likes chocolate", "Please, come!", "If only it would stop raining", "Is he there?" and "Long live the Republic!".

The aim of this paper is to develop a model-theoretical semantics for a formal language whose sentences are of the form f(p). All illocutionary forces syntactically realized in English are expressible in that language in which one can translate sentences whose main verb is in any mood, as well as interrogative and performative sentences. In this semantics, the meaning of a sentence is defined as a function from possible contexts of utterance into illocutionary acts that gives as value for each context the primary illocutionary act that the speaker of that context would attempt to perform if he were uttering that sentence in that context speaking literally and seriously. There is a recursive definition of the set of all illocutionary forces and an

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inductive definition of the conditions of success of all elementary illocutionary acts.

Until now logicians that have used formal semantics to interpret immediately or after translation fragments of natural languages have been confined to the truth-conditional aspects of sentence-meaning and have consequently constructed the linguistic competence of a speaker as his ability to understand the truth-conditions of the propositions expressed by literal utterances of sentences in the various possible contexts of use of a language. Their approach cannot account for the meaning-differences existing between sentences such as "Paul will come tomorrow", "Paul, please, come tomorrow!", "Will Paul come tomorrow?", "If only Paul would come tomorrow" that express the same propositions (or truth-conditions) with respect to the same possible contexts of utterance but are used to express illocutionary acts with different forces. As a consequence of this their formal semantics can only interpret declarative fragments of natural languages containing sentences whose verb is in the indicative mood and which express the illocutionary force of assertion.

In the formal semantics that I construct in this paper, on the contrary, I study both the illocutionary and the truth-conditional aspects of sentence-meaning, and linguistic competence is not dissociated from performance. The linguistic competence of a speaker is constructed as his ability to understand both the conditions of success and the conditions of satisfaction of the illocutionary acts that are expressed by literal and serious utterances of sentences in the various possible contexts of use of a language. The meaning differences existing between sentences with different illocutionary force markers, and the same clauses, can thus be explained by translating them into sentences expressing illocutionary acts with the same conditions of satisfaction, (the same propositional content), but with different conditions of success. The conditions of success of an illocutionary act are the conditions that must be obtained in a possible context of utterance in order that the speaker succeed in performing that act. Thus, for example, a condition of success of a promise is that the speaker commits himself to carrying out the future course of action represented by its propositional content. The notion of condition of satisfaction of an illocutionary act is a generalization of the traditional notion of truth-condition that is needed for a general theory of all

illocutionary forces. Just as an assertion is satisfied if and only if it is true, an order is satisfied if and only if it is obeyed, a request is satisfied if and only if it is granted, a promise is satisfied if and only if it is kept and so on. The conditions of satisfaction of an elementary illocutionary act are the conditions that must be obtained in a possible context of utterance in order that its propositional content be true in the world of utterance of that context.

One important purpose of a formal semantics for illocutionary forces is to construct adequately the two types of logical entailments (illocutionary and truth-conditional entailments) that exist between certain sentences of natural languages, and concern respectively the conditions of success and the conditions of satisfaction of the illocutionary acts that they express. A sentence f(p) illocutionarily entails a sentence f'(p') if and only if in every possible context of utterance where this sentence f(p) expresses an illocutionary act that is successfully performed by the speaker, the sentence f'(p') expresses an illocutionary act that is also performed in that context. Thus, for example, the two sentence "I beg you to come" and "I ask you whether it is raining" illocutionarily entail respectively the sentences "Please, come!" and "Is it raining?". Similarly, a sentence f(p) truth-conditionally entails a sentence f'(p') if and only if in every possible context of utterance where this sentence f(p) expresses an illocutionary act that is satisfied, the sentence f'(p') expresses an illocutionary act that is also satisfied in that context. Thus, for example, the sentence "Please do this" truth-conditionally entails the sentence "Do this or open the door!". In order to achieve its purpose a formal semantics for illocutionary forces must incorporate both an illocutionary logic (or a logic of the conditions of success of illocutionary acts) and an intensional logic (or a logic of the truth conditions of propositions). In this paper I will be mainly concerned with the illocutionary aspects of sentence meaning and with illocutionary entailment.

I- *The recursive definition of the set of all illocutionary forces*

The semantic analysis of illocutionary forces and the definition of the conditions of success of elementary illocutionary acts that I

develop in this paper is based on the logico-philosophical analysis that I have developed in my papers "Illocutionary logic and self-defeating speech-acts" (1980) and "What is an illocutionary force?" (1984) and in my forthcoming book with J. R. Searle *Foundations of illocutionary logic*. The basic ideas of this analysis are 1) that each illocutionary force has seven components, namely an illocutionary point, a mode of achievement and a degree of strength of illocutionary point, propositional content, preparatory and sincerity conditions and a degree of strength of sincerity conditions, and 2) that two illocutionary forces with the same components are identical and determine the same conditions of success. I will now explain rapidly the various components of illocutionary forces and give an explication (in Carnap (1956)'s sense) of the concepts of these components within formal semantics.

a) *Illocutionary point*

Whenever an illocutionary act of the form F(P) is performed in a context of utterance, the speaker always necessarily achieves an illocutionary point that determines how to relate the propositional content to the world. Thus, for example, a speaker who asserts or testifies represents as actual a state of affairs, a speaker who orders or requests makes an attempt to get the hearer to do something. The speaker who performs an illocutionary act may have all sorts of other intentions (e.g. various perlocutionary intentions) while performing that act, and these intentions depend on him, but he has always at least the intention of achieving the illocutionary point of the force of the act that he performs, because that point is internal to that force. In illocutionary logic, the notion of illocutionary point is primitive and is not derived from other notions. It is defined in extension as in Searle's (1975) taxonomy. There are five, and only five, illocutionary points. These are the assertive point which consists in representing as actual a state of affairs, the commissive point which consists in committing the speaker to a future course of action, the directive point which consists in making an attempt to get the hearer to do something, the declarative point which consists in bringing about a state of affairs in virtue of the utterance and the expressive point which consists in expressing a psychological state of the speaker about a state of affairs. This classification of illocutionary points is materially adequate in the

sense that there is no need to appeal to other illocutionary points in order to define explicitly all illocutionary forces that are syntactically realized or named in English as Searle and I have shown in the analysis of over one hundred performative verbs. Moreover, a philosophical justification of this classification can also be given by showing that these five illocutionary points exhaust the number of possible directions of fit between the propositional content of an illocutionary act and the world, as I will now show. There are four and only four directions of fit in language:

1) *the word-to-world direction of fit*
In case the illocutionary act is satisfied, its propositional content fits a state of affairs existing independently in the world. Illocutionary acts with an assertive illocutionary force have the word-to-world direction of fit. Their point is to represent how things are in the world.

2) *the world-to-word direction of fit*
In case the illocutionary act is satisfied, the world is altered to fit its propositional content. Illocutionary acts with commissive or directive illocutionary force have the world-to-word direction of fit. Part of their point is to get the world to match the propositional content by the action of the speaker (commissives) or by the action of the hearer (directives).

3) *the double direction of fit*
In case the illocutionary act is satisfied, the world is altered to fit its propositional content by representing the world as being so altered. Illocutionary actswith a declarative force have the double direction of fit. Their illocutionary point is to make the world match the propositional content by saying that the propositional content matches the world.

4) *the null or empty direction of fit*
For some illocutionary acts, there is no question of achieving success of fit because in general their propositional content is presupposed to be true. Illocutionary acts with an expressive force have the null or empty direction of fit. Their point is to express propositional attitudes of the speaker about the state of affairs represented by the propositio-

nal content and not to say that the propositional content matches the world, nor to get the world to match the propositional content.

The five illocutionary points have different conditions of achievement. As a consequence of this, each illocutionary point is identified in illocutionary logic with the unique relation Π that holds between a possible context of utterance i and a proposition P if and only if the speaker in that context achieves that illocutionary point on that proposition. Thus, if I and Prop are respectively the set of all possible contexts of utterance and the set of all propositions, there are in illocutionary logic five primitive relations Π_1, Π_2, Π_3, Π_4 and Π_5 on $I \times Prop$ that represent respectively the conditions of achievement of the assertive, commissive, directive, declarative and expressive illocutionary points. Each illocutionary point is then formally represented by a unique subset Π of the Cartesian product $I \times Prop$ of the sets of all possible contexts of utterance and of all propositions.

Some illocutionary points are stronger than others in the sense that it is not possible to achieve them on a proposition without also achieving the others on that proposition. For example, one cannot bring about a state of affairs by declaration without representing as actual that state of affairs and consequently $\Pi_4 \subset \Pi_1$. In case whenever an illocutionary act of the form F(P) is performed in a context of utterance, the speaker always achieves several illocutionary points Π, Π',... on the propositional content P, one of these illocutionary points is stronger than all others so that the intersection of all these points $\Pi \cap \Pi' \cap \ldots$ is one of the five illocutionary points. In that case, it is natural to identify the illocutionary point of that force with the strongest illocutionary point. Although illocutionary point is the most important component of illocutionary force, it is not the only component as is shown by the fact that there are many different illocutionary forces with the same point.

b) *The degree of strength of the illocutionary point*

Most illocutionary points can be achieved with different degrees of strength. For example, a speaker who swears to do something commits himself more than a speaker who simply accepts to do it. A speaker who commands makes a stronger attempt to get the hearer to

do something than a speaker who simply recommends him to do it. As a consequence of this the relations determing the conditions of achievement of the illocutionary points are indexed by the set Z of integers. Zero is interpreted as the degree of strength with which the illocutionary point has to be achieved in case of a performance of an illocutionary act with a primitive force, +1 is the next greater degree of strength, −1 the next smaller degree of strength than 0 and so on. Thus, if $k \in Z$, $\Pi^k \subset \Pi$ is hereafter the set of all ordered pairs $<i,P>$ such that the speaker in the context i achieves the illocutionary point Π with the degree of strength k on the proposition P. By definition, the degree of strength of the illocutionary point of an illocutionary force is the greatest degree with which its illocutionary point is always achieved in case of a successful performance of an act with that force.

c) *The mode of achievement of the illocutionary point*

Illocutionary points, like most points of our actions, can be achieved in various ways and by different means. Some illocutionary forces impose restrictions on the set of conditions under which their illocutionary point must be achieved in case of a successful performance of acts with these forces. Thus, for example, a speaker who requests must make the attempt to get the hearer to do something while giving him option of refusal. A speaker who orders, on the other hand, must invoke a position of authority or of power over the hearer. Formally, a mode of achievement μ of an illocutionary point Π is a function from Π into a set of two values $2 = \{1,0\}$ that restricts the conditions of achievement of that point. Thus, for example, the special mode of achievement of a testimony is formally that function μ with domain Π_1 that gives the value 1 for a pair $<i,P>$ if and only if the speaker in the context i represents as actual the state of affairs that P in his capacity as a witness. A mode of achievement of an illocutionary point Π is special when it is possible to achieve that point without that mode i.e. when $\Pi \neq \{ <i,P> / \mu(i,P) = 1\}$. Because it is not possible to achieve some illocutionary points with certain modes without achieving them with a minimal degree of strength (for example it is not possible to achieve the directive point by invoking a position of authority over the hearer without making a strong attempt), there are logical connections between the mode of achievement and the degree of strength of illocutionary point of certain forces. Each mode of achievement μ of a

point Π determines a degree of strength of illocutionary point which is the greatest integer k such that if $\mu(i,P) = 1$ then $<i,P> \in \Pi^k$.

d) *Propositional content conditions*

Some illocutionary forces impose restrictions on the set of propositions that they can take as propositional contents. Thus, for example, the propositional content of a prediction must represent a future state of affairs with respect to the time of the utterance, the propositional content of a promise must represent a future course of action of the speaker. Such conditions are called propositional content conditions. Formally, a propositional content condition is a function θ from I into $\mathfrak{S}$ (Prop) which gives as value for each context a set of propositions having certain properties with respect to that context. Thus, for example, the propositional content conditions of an order are formally represented by that function θ from I into $\mathfrak{S}$ (Prop) such that θ (i) is the set of all propositions that represent courses of action of the hearer of i occuring after the moment of utterance of that context. Some propositional content conditions of an illocutionary force are determined by its point because it is not possible to achieve that point on a proposition that does not satisfy these conditions. Thus, for example, all illocutionary forces with the commissive point have the propositional content condition that their propositional content represents a future course of action of the speaker. Other propositional content conditions are special conditions of certain forces. Thus, for example, the illocutionary force of reports, but not all assertive illocutionary forces, has the special condition that its propositional content must represent a past or present state of affairs.

e) *Preparatory conditions*

Whenever an illocutionary act of the form F(P) is performed, the speaker always presupposes that certain propositions are true in the world of the utterance. For example, a speaker who advises someone to do something presupposes that it is good for him to do it. A speaker who promises to do something presupposes that he is capable of doing it. These presuppositions are not propositional content presuppositions but are peculiar to illocutionary force. The preparatory conditions of an illocutionary force determine which propositions the speaker must presuppose when he performs an act with that force in a

context of utterance. Formally, a preparatory condition is a function Σ from $I \times$ Prop into $\mathcal{O}$ (Prop). Thus, for example a preparatory condition of the force of requests is that function Σ such that Σ (i,P) = {the proposition that the hearer of i is capable of carrying out the future course of action represented by P}.

f) *Sincerity conditions*

Whenever an illocutionary act of the form F(P) is performed, the speaker always expresses psychological states of some types about the state of affairs represented by the propositional content. Thus, for example, a speaker who asserts expresses his belief in the truth of the propositional content, a speaker who requests expresses a desire and a speaker who apologizes expresses sorrow or regret. The sincerity conditions of an illocutionary force determine which psychological states the speaker must express in case of a successful performance of an act with that force in a context of utterance. Formally, a sincerity condition is a function Ψ from $I \times$ Prop into $\mathcal{O}(M \times \text{Prop})$ where M is the set of all types of propositional attitudes. For example, a sincerity condition of the force of promise is that function Ψ such that Ψ (i,P) = {Intention (P)}. A speaker who performs an illocutionary act is sincere if and only if he actually possesses all the psychological states determined by the sincerity conditions.([1])

g) *The degree of strength of the sincerity conditions*

Just as the illocutionary point can be achieved with different degrees of strength, the psychological states determined by the sincerity conditions can also be expressed with different degrees of strength. For example, a speaker who supplicates expresses a stronger desire than a speaker who requests. The degree of strength of the sincerity conditions of an illocutionary force is the greatest degree of strength with which the psychological states determined by its sincerity conditions are always expressed, in case of a successful perfor-

([1]) Since a speaker can presuppose a proposition that turns out to be false in the world of the utterance or express a psychological state that he does not possess, some successful performances of illocutionary acts are defective. An illocutionary act is non-defectively performed in a context of utterance if and only if it is performed in that context and the preparatory and sincerity conditions are satisfied. On this account all non-defective illocutionary acts are successful but the converse is not true.

mance of an act with that force. As the degree of strength of the illocutionary point, it is represented in illocutionary logic by an integer.

The preceding analysis of the notion of illocutionary force which divides each force into seven components permits me to formulate the following law of identity for illocutionary forces: Two illocutionary forces are identical if and only if they are the same with respect to their seven components. Here are a few examples of illocutionary forces that differ from assertion by at least one component. A conjecture has smaller degrees of strength than assertion. An information has the additional mode of achievement that the speaker has the perlocutionary intention to get the hearer to know the truth of the propositional content. A confession has the additional propositional content condition that the propositional content predicates of the speaker responsibility for a certain state of affairs. To remind is to assert to a hearer with the additional preparatory condition that he once knew, but might have forgotten, the truth of the propositional content. A complaint has the additional sincerity condition that the speaker is dissatisfied with the state of affairs represented by the propositional content.

An illocutionary force is not a simple juxtaposition of its seven components because there are logical relations between components of illocutionary force. Thus, for example, the mode of achievement of an illocutionary force is a mode of achievement of its point and not of another point. The degree of strength of illocutionary point of an illocutionary force is always identical with the degree of strength of its sincerity conditions, except when its mode of achievement determines a degree of strength of illocutionary points superior to that degree. Moreover some components determine other components. For example, some illocutionary points determine certain propositional content conditions, preparatory conditions and sincerity conditions, because it is not possible to achieve these points on a proposition without presupposing these preparatory conditions, expressing these sincerity conditions and taking a propositional content satisfying these propositional content conditions.

On the basis of this formal analysis of illocutionary force, I now formulate the following recursive definition of the set of all illocutionary forces.

1- The set of all illocutionary forces contains a finite number of primitive illocutionary forces. The primitive illocutionary forces are the simplest possible forces; they have an illocutionary point, no special mode of achievement of that point, zero degrees of strength and only the propositional content, preparatory and sincerity conditions that are determined by their point. As there are five illocutionary points, there are consequently five primitive illocutionary forces. These are:

– The illocutionary force of assertion which is the primitive assertive illocutionary force. This force has empty propositional content conditions,([2]) the only preparatory condition that the speaker has reasons supporting the truth of the propositional content and the only sincerity condition that the speaker believes the propositional content. It is realized syntactically in English in the indicative mood of sentences such as "He is here", "John loves Mary".
– The primitive commissive illocutionary force. This force has the only propositional content condition that its propositional content represents a future course of action of the speaker, the only preparatory condition that the speaker is capable of that course of action and the only sincerity condition that he intends to carry it out. The primitive commissive illocutionary force is not expressed by a mood in English but is named by the performative verb "commit". The standard way to commit oneself to doing something in English is to commit oneself either indirectly by way of asserting that one will do it e.g. by saying "I will come" or by way of declaring that one commits oneself to doing it e.g. by using a performative sentence such as "I promise that I will come".([3])
– *The primitive directive illocutionary force*. This force has the only propositional content condition that its propositional content represents a future course of action of the hearer, the only preparatory

([2]) A propositional content condition θ is empty if and only if for all contexts i, θ (i) = Prop. A preparatory condition Σ and a sincerity condition Ψ are empty if and only if Σ (i,P) = Ψ (i,P) = $\emptyset$.

([3]) There is a commissive sentence mood in Corean. An inventary of the sentence moods and their markers in six typologically differing languages is made in Zaefferer (forthcoming).

condition that the hearer is capable of carrying out that action and the only sincerity condition that the speaker desires or wants the hearer to carry it out. It is realized syntactically in English in the imperative mood.

– *The illocutionary force of declaration*. This force has empty propositional content conditions, the only preparatory condition that the speaker is capable of bringing about the state of affairs represented by the propositional content by his utterance and the only sincerity conditions that he believes that he brings about that state of affairs and that he desires to bring it about. The illocutionary force of declaration is realized syntactically in English in the indicative mood of performative sentences such as "I request you to come", "I ask you whether it is raining".

– *The primitive expressive illocutionary force*. This force has empty propositional content, preparatory and sincerity conditions. It is not realized syntactically in English presumably because it is the only illocutionary force where variable sincerity conditions are part of the point. The only illocutionary forces that are expressed in English are derived illocutionary forces with special sincerity conditions such as, for example, the expressive force of wish or desire which is expressed in English by the subjunctive or conditional mood of sentences such as "God bless you" and "If only he would do it".

2- All other illocutionary forces are obtained from the primitive forces by applying operations that do not modify illocutionary point but enrich the other components of these forces. These operations consist in restricting the mode of achievement, increasing or decreasing by one the degrees of strength and adding new special propositional content, preparatory and sincerity conditions. If F is an illocutionary force, θ is a propositional content condition Σ is a preparatory condition, Ψ is sincerity condition and μ is a mode of achievement, then $[\theta]F$, $[\Sigma]F$, $[\Psi]F$, $[\mu]F$, $[+1]F$ and $[-1]F$ are new derived illocutionary forces when the illocutionary point of these new forces, (i.e. the intersection of all illocutionary points that are achieved on the propositional content in case of a successful performance of an act with these new forces), is identical with the illocutionary point of F.$[\theta]F$ is the illocutionary force that is obtained by adding propositional content conditions θ to F. $[\Sigma]F$ is the illocutionary force that is

obtained by adding preparatory conditions Σ to F. $[\Psi]$F is the illocutionary force that is obtained by adding sincerity conditions Ψ to F. $[\mu]$F is the illocutionary force that is obtained by imposing mode of achievement μ to F. Finally, $[+1]$F and $[-1]$F are the illocutionary forces that are obained by respectively increasing and decreasing by one the degrees of strength of F. Here are some examples of derived English directive illocutionary forces. The illocutionary force of request is obtained from the primitive directive by imposing the special mode of achievement that the speaker gives option of refusal to the hearer. The illocutionary force of a yes-no question is obtained from request by adding the special propositional content condition that the propositional content represents a future speech-act of the hearer to the original speaker. The illocutionary force of suggestion is obtained from the primitive directive by decreasing both degrees of strength. The illocutionary force of recommendation is obtained from the illocutionary force of suggestion by adding the special preparatory condition that the future course of action represented by the propositional content is good.

The operations on illocutionary forces are realized syntactically in English by modifiers of illocutionary force markers such as for example the adverbial expressions "Please" and "Frankly" in the sentences "Please do it!" and "Frankly he is here".

The conditions of success of all elementary illocutionary acts are defined inductively as follows:

– An illocutionary act of the form F(P) where F is a primitive force is performed in a context of utterance if and only if the speaker in that context achieves the illocutionary point of F on the propositional content P with the zero degree of strength.
– An illocutionary act of the form $[\theta]$F(P) is performed in a context of utterance i if and only if the illocutionary act F(P) is performed in that context and the proposition P satisfies the propositional content conditions θ with respect to that context (i.e. if $P \in \theta(i)$). Thus, for example, a speaker reports that P if and only if he asserts P and P represents a past or present state of affairs with respect to the context of utterance.
– An illocutionary act of the form $[\Sigma]$F(P) is performed in a context of utterance i if and only if the illocutionary act F(P) is performed in that

context and the speaker presupposes in that context all propositions $\Sigma(i,P)$ determined by the new preparatory condition Σ. Thus, for example, a speaker reminds a hearer that P if and only if he asserts P and presupposes that the hearer once knew but might have forgotten the propositional content.

– An illocutionary act of the form $[\Psi]\,F(P)$ is performed in a context of utterance i if and only if the illocutionary act F(P) is performed in that context and the speaker expresses in that context all psychological states $\Psi(i,P)$ determined by the sincerity condition Ψ. Thus, for example, a speaker boasts that P if and only if he asserts P and expresses pride in the existence of the state of affairs represented by P.

– An illocutionary act of the form $[\mu]\,F(P)$ is performed in a context of utterance i if and only if the illocutionary act F(P) is performed in that context and the speaker also achieves in that context the illocutionary point of F on P with the special mode of achievement μ (i.e. if $\mu(i,P) = 1$). Thus, for example, a speaker testifies that P if and only if he asserts P and represents as actual the state of affairs that P in his capacity as a witness.

– When the degree of strength of the illocutionary point and the degree of strength of the sincerity conditions of illocutionary force F are identical, an illocutionary act of the form $[+1]\,F(P)$ is performed in a context of utterance i if and only if the illocutionary act F(P) is performed in that context and the speaker in that context both achieves the illocutionary point of F on P and expresses the psychological states determined by the sincerity conditions of F with greater degrees of strength. Otherwise, the illocutionary act $[+1]\,F(P)$ is performed in a context of utterance i if and only if the illocutionary act F(P) is performed in that context and the speaker expresses in that context the psychological states determined by the sincerity conditions of F with a degree of strength of sincerity conditions superior to that of F.(4) Thus, for example, a speaker pledges to do something if

(4) The reason why the degree of strength of the illocutionary point of the derived force $[+1]\,F$ is increased only in the case where the degree of strength of the illocutionary point and the degree of strength of the sincerity conditions of the simpler force F are identical is that I want to validate the law that the degree of strength of the illocutionary point of an illocutionary force is always the maximum of the degree of

and only if he commits himself to doing it and the degree of strength of his commitment, as well as the degree of strength with which he expresses his intention to keep his commitment, are superior to the degrees of strength of the primitive commissive force.

– Finally an illocutionary act of the form $[-1]F(P)$ has conditions of succes such that the illocutionary act $[+1][-1]F(P)$ is performed in a context of utterance i if and only if F(P) is performed in that context. Thus, for example, a speaker suggests to a hearer to do something if and only if he makes a weak attempt to get him to do that and expresses a weak desire that he do it.

The components of an illocutionary force F are easily defined in the following way from the conditions of success of all acts with that force: The *illocutionary point* Π_F of a force F is the intersection of all illocutionary points that are necessarily achieved on the propositional content when an act with this force is performed.

Thus, $\Pi_F = \cap \Pi$

for all Π such that if F(P) is performed in i then $i \Pi P$.

The *degree of strength of illocutionary point* degre (F) of a force F is the greatest integer k such that if an illocutionary act F(P) is performed in a context i then $<i,P> \in \Pi_F^k$.

The *mode of achievement* of an illocutionary force F is the conjunction of all modes of achievement with which its illocutionary point is necessarily achieved when there is a successful performance of an act with that force. Thus, mode (F) is the conjunction of all modes μ of Π_F such that if F(P) is performed in i then $\mu(i,P) = 1$. (A conjunction of two modes of achievement μ_1, μ_2 of an illocutionary point is a mode μ such that $\mu(i,P) = 1$ if and only if $\mu_1(i,P) = \mu_2(i,P) = 1$.)

The *propositional content conditions* $Prop_F$ of a force F are the intersection of all propositional content conditions that are satisfied by the propositional content when there is a successful performance of an act with that force. (The intersection of two propositional content conditions θ_1, θ_2 is that condition θ such that $\theta(i) = \theta_1(i) \cap \theta_2(i)$.)

Thus $Prop_F = \cap \theta$

for all θ such that if F(P) is performed in i then $P \in \theta(i)$.

strength of the sincerity conditions and of the degree of strength of illocutionary point determined by the mode of achievement.

The *preparatory conditions* Σ_F of an illocutionary force F are the union of all preparatory conditions that are necessarily presupposed when an act with that force is performed.

Thus $\Sigma_F = \cup\Sigma$

for all Σ such that if F(P) is performed in i then the speaker presupposes Σ (i,P) in i.

(The union of two preparatory conditions Σ_1, Σ_2 is that preparatory condition Σ such that Σ (i,P) = Σ_1 (i,P) $\cup\Sigma_2$ (i,P).)

The *sincerity conditions* Ψ_F of a force F are the union of all sincerity conditions that are necessarily expressed when an act with this force is performed.

Thus $\Psi_F = \cup\Psi$

for all Ψ such that if F(P) is performed in i then the speaker expresses Ψ (i,P) in i.

Finally, the *degree of strength of the sincerity conditions* of a force F is the greatest degree of strength with which the psychological states determined by its sincerity conditions are always expressed in case of a successful performance of an act with that force.

The preceding definitions constitute simultaneously an inductive definition of the conditions of success of all elementary illocutionary acts of the form F(P), and a definition of the components of all illocutionary forces. In order to construct a completely set-theoretical formal semantics for illocutionary forces it is useful to adopt an axiom of extensionality for illocutionary acts according to which illocutionary acts with the same conditions of success are identical. Thus two illocutionary acts $F_1(P_1)$ and $F_2(P_2)$ are hereafter considered to be identical if and only if they are performed in the same possible contexts of utterance.

Such an axiom of extensionality has a certain philosophical sense. Different illocutionary acts must indeed serve different linguistic purposes and different linguistic purposes should be achievable under different circumstances.

Moreover, this axiom of extensionality permits me to identify formally each illocutionary act with the function from possible contexts of utterance into success values that gives the value success for a context i if and only if that act is performed in that context. If 2 = {1,0} is a set of two values where 1 is success and 0 is lack of success or failure when illocutionary acts are evaluated, the set of all

elementary illocutionary acts is then formally constructed as a proper subset of the set 2^I of all functions from contexts of utterance into success values. This explication of the notion of illocutionary act explains some cognitive aspects in the psychology of the comprehension of language. For example, it explains the fact that one can understand which illocutionary act is expressed by an utterance of a sentence without knowing if the act is actually successfully performed in the context of the utterance (if for example one does not know if the speaker has the necessary power to perform that act). But clearly one cannot understand which illocutionary act is expressed by an utterance without knowing which conditions must be obtained in a possible context of utterance in order that the speaker succeed in performing that act, and this is also explained by my explication of the notion of illocutionary act.

Since each illocutionary force F associates with each proposition P an elementary illocutionary act of the form F(P), illocutionary forces can in turn, thanks to the axiom of extensionality, be identified with functions from propositions into elementary illocutionary acts. The set of all illocutionary forces is then a proper subset of the set $(2^I)^{Prop}$. Each illocutionary force F is formally that function that associates with each proposition P the function from I into 2, corresponding to the elementary illocutionary act F(P).

One drawback of the axiom of extensionality is that it identifies all self-defeating illocutionary acts i.e. all acts that have impossible conditions of success. Such acts are expressed in English by odd sentences such as "I order you to have eaten beans yesterday", "I never make any assertion", "I won't keep this promise". Unlike the identification of all impossible propositions in intensional logic, the identification of all self-defeating illocutionary acts does not raise particular philosophical problems because the self-defeating illocutionary act is only properly speaking a limit case of illocutionary act that one admits for the sake of generality. This act indeed can never be performed. Moreover the admission of one and only one self-defeating illocutionary act allows for a major formal simplification of illocutionary logic similar to the one that one obtains with the admission of zero in arithmetics or of the empty set in set-theory.

II- *Illocutionary aspects of the logical form of elementary sentences*

As I said earlier, it is part of the meaning of each elementary sentence of the form f(p) of a natural language that a literal and serious utterance of that sentence constitutes an attempt by the speaker to perform a certain illocutionary act of the form F(P), which is the illocutionary act literally expressed by that sentence with respect to the context of the utterance. Formally the meaning of a sentence f(p) is thus a function $\| f(p) \| \in (2^I)^I$. The meaning of the illocutionary force marker of an elementary sentence determines the illocutionary force of the act literally expressed by this sentence in each possible context (when the relevant contextual features are specified). Formally, the meaning of an illocutionary force marker f is then a function $\| f \| \in (2^I)^{Prop^I}$ from possible contexts of utterance into illocutionary forces. On the other hand, the meaning of the clause p determines the propositional content of the act expressed by the sentence with respect to each context of utterance (when the relevant contextual features are specified). Formally, its meaning is then a function $\| p \| \in Prop^I$ from possible contexts of utterance into propositions. The meaning of a sentence of form f(p) is composed out of the meanings of its constituents by functional application. Thus, $\| f(p) \| = \| f \| (\| p \|)$ so that the literal illocutionary act $\| f(p) \|_i$ expressed by a sentence f(p) with respect to a context i is the act $\| f \|_i (\| p \|_i)$.

As the object-language of the semantics for illocutionary forces is an ideal language, the sentences of a natural language cannot be directly interpreted in this semantics but must first be translated into sentences of the ideal language representing their logical form (or at least the illocutionary aspects of their logical form). In this section I will make a few remarks about the logical form of elementary sentences that will be useful for understanding how to translate sentences of natural languages into the formal language of illocutionary logic and I will mention a few facts concerning the use of natural languages that I want to account for in the semantics of that logic.

1. Not all illocutionary force markers are syntactically simple markers such as, for example, the subjunctive and imperative moods in the sentences "Let there be light" and "Come!". Some are syntactically complex and are constructed by combining a modifier of illocutionary

force markers such as, for example, "Please" and "Frankly" with a simpler illocutionary force marker, such as, for example, the mood of the verb in the sentences "Please, come!" and "Frankly, he is here". Modifiers of illocutionary force markers express operations on illocutionary forces. Thus, for example, "Please" expresses the operation which consists in restricting the mode of achievement of the directive illocutionary point by imposing that the speaker gives option of refusal to the hearer and "Frankly" (like an increase of intonation) expresses an operation which consists at least in increasing degree of strength. A complex illocutionary force marker of the form (h f) where h is a modifier expresses the derived illocutionary force obtained by applying the operation expressed by the modifier h to the illocutionary force expressed by the marker f. Thus "Please" with the imperative mood expresses the illocutionary force of request and "Frankly" with the indicative mood expresses strong assertion in the preceding sentences.

2. Contrary to what Austin says, performative verbs in performative sentences are not illocutionary force markers. In performative sentences, the illocutionary force marker is the indicative mood of the performative verb which expresses the illocutionary force of declaration. On this account a literal and serious utterance of a performative sentence expresses a declaration whose propositional content is that the speaker performs the illocutionary act with the force named by the performative verb. Thus for example, by saying "I ask you whether it is raining" the speaker expresses a declaration whose propositional content is that he is asking a question, and by saying, "I request you to come" he expresses a declaration whose propositional content is that he is requesting the hearer to come. He could have expressed simply the question and the request (without declaration) by saying "Is it raining?" and "Please, come!". Since the illocutionary point of a declaration is to bring into existence the state of affairs represented by the propositional content, a successful declaration is always satisfied. This explains why a successful literal utterance of a performative sentence also constitutes a performance of the illocutionary act with the force named by the performative verb that occurs in its clause.

3. Most illocutionary force markers are like the question mark and the imperative mood and express the same illocutionary force with respect to all possible contexts of utterance. But some express different forces with respect to different contexts. The indicative mood for example in the sentence "You are fired" may be used to express the illocutionary force of declaration, (if the sentence is used performatively), or it may be used to express simply the illocutionary force of assertion. In order to determine the illocutionary force expressed by a marker in a context of utterance, it is thus sometimes necessary to have certain factual information about the context. For example, in order to determine which illocutionary force is expressed by an utterance of the sentence "You are fired", one must know whether the speaker has the intention to bring about the state of affairs represented by the propositional content or if he has only the intention to represent that state of affairs as actual. One can consequently understand the meaning of a sentence without understanding the literal illocutionary force of an utterance of that sentence in a possible context of utterance when the illocutionary force marker is semantically ambiguous and when one does not have the relevant contextual information. Similarly, when the clause of an elementary sentence contains, for example, demonstratives or ambiguous expressions, one is not able to understand the truth conditions of the proposition literally expressed by an utterance of that sentence when one does not have the contextual information that is necessary for determining the denotation or senses of these expressions. This is why the meaning of the sentence is *not*, as is often wrongly assumed, one or several illocutionary acts but is a function from possible contexts of utterance into illocutionary acts. An elementary sentence often expresses many different illocutionary acts (with different forces and different propositional contents) with respect to different possible contexts of utterance but its meaning is nevertheless invariant from one context to another. Its meaning only determines an illocutionary act with respect to a given context of utterance when all the relevant contextual features are specified. Thus in order to understand the conditions of satisfaction and the conditions of success of the illocutionary act literally expressed by an utterance of a sentence, one must often compose the meaning of the sentence with some empiric information about the context of the utterance.

4. Any sentence of the form f(p) expresses with respect to each possible context of utterance a certain elementary illocutionary act even if that sentence has not been used in this context, or if it has been used by the speaker to perform indirectly, metaphorically or ironically another primary illocutionary act, or if the speaker has used it in that context with the intention to perform the illocutionary act that it expresses, but did not actually succeed in performing it. The meaning of a sentence is a function from *possible* contexts of utterance into illocutionary acts. In some possible contexts of utterance, certain sentences are not used by the speaker, who utters at most a finite number of sentences in a context. But each sentence of a natural language can be evaluated in a semantics with respect to each possible context of use of that language because the act expressed by a sentence in a possible context of utterance is by definition the primary act that the speaker would attempt to perform if he were using that sentence in that context speaking literally and seriously, and such a literal illocutionary act exists in each context no matter if the speaker has used that sentence or not.

Moreover, the meaning of a sentence is a function into literal *possible* illocutionary acts and not into actual illocutionary acts. Even if a sentence is used by the speaker in a context of utterance, the literal illocutionary act expressed by that sentence with respect to that context is not necessarily the primary illocutionary act that the speaker attempts to perform in that context, because speaker meaning is not always identical with sentence meaning (cases of indirect speech acts, metaphors, irony). Finally, even if the speaker uses a sentence in a context of utterance while speaking literally and seriously, his utterance does not necessarily constitute the performance of the literal illocutionary act because the conditions of success of that act might not be satisfied in the context of the utterance. Just as it is not enough to use a sentence expressing a proposition in a context of utterance in order that that proposition be true, it is not sufficient to use a sentence expressing an illocutionary act F(P) in order that that act be successfully performed in that context. Thus for example an utterance of the performative sentence "You are fired" constitutes a successful declaration only if the speaker has the power to fire the hearer by this utterance. An attempt to perform an illocutionary act may be succesful in one context of utterance and may fail in another

one, if the conditions of success are not satisfied. (5)

III. *Definition of the object-language of the formal semantics for illocutionary forces*

This object-language L contains in its lexicon expressions of the following syntactic categories:

(i) propositional constants p_1, p_2, p_3,...

(ii) for each natural number n, propositional connectives of degree n: d_n^1, d_n^2, d_n^3,... including the logical constants $\sim$ for truth-functional negation, $\rightarrow$ for material implication, and $\Box$ for logical necessity,

(iii) illocutionary force markers f_1, f_2, f_3,... including the logical constants $\vdash$ for assertion, $\perp$ for the primitive commissive force, ! for the primitive directive force, T for declaration and $\dashv$ for the primitive expressive force,

(iv) modifiers of illocutionary force markers h_1^μ, h_2^μ, h_3^μ,... expressing operations consisting in restricting the mode of achievement of an illocutionary point, h_1^θ, h_2^θ, h_3^θ,... expressing operations which consist in adding propositional content conditions, h_1^Σ, h_2^Σ, h_3^Σ,... expressing operations which consist in adding preparatory conditions, h_1^Ψ, h_2^Ψ, h_3^Ψ,... expressing operations which consist in adding sincerity conditions and the logical constants + et − that express respectively the operations which consist in increasing and decreasing by one the degrees of strength.

The rules of formation of the language L are the following:

All propositional constants of the lexicon of L are clauses of L.
If $p_{m1},\ldots,p_{mn}$ are n clauses of L and if d_n is a propositional connective of degree n of the lexicon of L, then $d_n p_{m1}\ldots p_{mn}$ is a new clause of L.

All illocutionary force markers of the lexicon of L are illocutionary

(5) The law of excluded middle does not apply to success and failure as it applies to truth and falsity. A proposition which is not true is false, but an illocutionary act that the speaker does not perform is not necessarily an illocutionary act that he fails to perform because a failure implies an attempt of performance and because a speaker does not attempt to perform each illocutionary act in every context.

force markers of L. If f is an illocutionary force marker of L and h is a modifier of illocutionary force marker of the lexicon of L, then h f is a new illocutionary force marker of L.

If f is an illocutionary force marker of L and if p is a clause of L, then f(p) is a sentence of L. If f(p) is a sentence of L, then ^f(p) is a new clause of L. There are no other clauses or sentences of L than those that can be obtained by the application of the preceding rules.

Definition of the set of all well-formed formulas of L.

An expression is a well-formed formula of L if and only if it is an expression of the lexicon of L or a clause of L or an illocutionary force marker of L or a sentence of L.

The naive interpretation of L is the following: The propositional constants express propositions. The propositional connectives of degree n express n-ary operations on propositions. A complex clause of the form $d_n p_{m1} \ldots p_{mn}$ expresses the complex proposition that is obtained by applying the operation expressed by d_n to the n-uple of propositions expressed respectively by $p_{m1},\ldots,p_{mn}$. The illocutionary force markers of the lexicon express primitive illocutionary forces. The modifiers of illocutionary force markers express unary operations on illocutionary forces of the appropriate type. A complex illocutionary force marker of the form h f expresses the illocutionary force that is obtained by applying the operation expressed by h to the force expressed by f. Thus for example + f expresses with respect to each context of utterance the illocutionary force that is obtained by increasing the degrees of strength of the force expressed by f in that context. A sentence of the form f(p) expresses with respect to each context the illocutionary act with the illocutionary force and the propositional content respectively expressed by f and p in that context. A clause of the form ^f(p) expresses with respect to each possible context of utterance a proposition that is true in the world of that context if and only if the speaker performs the illocutionary act expressed by f(p) in that context. Thus a sentence T ^f(p) is the performative sentence corresponding to the sentence f(p) in the ideal language L. It expresses with respect to each possible context of utterance a declaration whose propositional content is that the speaker performs the illocutionary act expressed by f(p) in that context. Thus, for example, if f(p) is interpreted as a translation of "It is

raining", T ^f(p) is to be interpreted as a translation of "I assert that it is raining".

IV. *Definition of the structure of a model or of a possible interpretation for L*

A model or a possible interpretation for the language L is a set-theoretical structure that evaluates all sentences of that language by associating with each sentence with respect to each possible context of use of L considered in that interpretation, a certain illocutionary act whose conditions of satisfaction and of success are explicitly defined in that interpretation. This evaluation of sentences is made in accordance with a principle of composition of meanings (the evaluation of a complex formula is a function of the evaluations of its constituent formulas) and obeys the various meaning postulates governing the use of the logical constants. The fundamental semantic notions of illocutionary logic (logical truth, analyticity, consistency, truth-conditional and illocutionary entailments) are defined by quantifying over the class of all possible interpretations for L. The aim of this section is to define the formal structure that is common to all possible interpretations of L. In the next section I will formulate some philosophically or linguistically significant semantic generalizations.

A *possible interpretation or model for* L is a nine-uple $\mathcal{M} = <I, W, M, Prop, [\,], \Sigma up, \Psi up, \Phi, \|\,\|>$ where I, W, M, Prop and Φ are non-empty sets and $[\,], \Sigma up, \Psi up$ and $\|\,\|$ are functions satisfying the following clauses:

1) I is the set of all possible contexts of use of L in which sentences of that language can be uttered according to the possible interpretation $\mathcal{M}$. There is a function γ from I into $\mathfrak{S}$ (L) which gives as value for each context i the set γ (i) containing the sentence used by the speaker in that context. Thus γ (i) = $\emptyset$ if and only if the speaker of i does not use any sentence in that context according to $\mathcal{M}$.(6)

(6) For the sake of simplicity, I make as if each speaker uses at most one sentence in each context of utterance.

2) W is the set of all possible worlds in the interpretation $\mathcal{M}$. To each possible context of utterance $i \in I$ corresponds one and only one possible world $w_i \in W$ which is the world of utterance of that context.

3) M is the set of all types of psychological states, and Prop is the set of all propositions that are expressible in the language L under the interpretation $\mathcal{M}$.

4) [ ] is a function whose domain is the set Prop which gives as value for each proposition $P \in Prop$, a function from the set W of all possible worlds into a set $2 = \{0,1\}$ of two values. $[P](w) = 1$ in case P is true in the world w according to the possible interpretation $\mathcal{M}$ and $[P](w) = 0$ in case P is false in w according to $\mathcal{M}$.(7)

5) There are five primitive relations $\Pi_1, \Pi_2, \Pi_3, \Pi_4, \Pi_5 \subset I \times Prop$ that determine respectively the conditions of achievement of the assertive, commissive, directive, declarative, and expressive illocutionary points in the possible interpretation $\mathcal{M}$. These relations are indexed by the set Z of all integers. Thus if Π is an illocutionary point and k is an integer, $i\Pi^k P$ holds in $\mathcal{M}$ if and only if the speaker achieves in i the illocutionary point Π on P with the degree of strength k. The illocutionary points obey the following postulates:

(i) *Each illocutionary point is achieved with a greatest degree of strength in each context.*
If $i\Pi P$ then for some $k \in Z$, $i\Pi^k P$ and for all $n > k$, it is not the case that $i\Pi^n P$.

(ii) *A successful declaration is satisfied.*
If $i\Pi_4 P$ then $[P](w_i) = 1$.

(iii) *There is an assertive commitment in the achievement of the declarative point.*
If $i\Pi_4^k P$ then $i\Pi_1^k P$.

(7) It is the proper task of the intensional logic that is part of the semantics of illocutionary forces to define adequately that function that evaluates propositions with respect to possible worlds.

(iv) *Two propositions are identical if and only if they are substitutible within all illocutionary points.*
$P_1 = P_2$ if and only if, for all illocutionary points Π, $i\Pi^k P_1$ if and only if $i\Pi^k P_2$.

6) Σ up is a function whose domain is the set I and which gives as value for each context i the set Σ up (i) of all propositions that are presupposed by the speaker in that context according to possible interpretation $\mathcal{M}$. This function represents formally the relation of pragmatic presupposition in $\mathcal{M}$. Ψ up on the other hand is a function from I into $\mathfrak{S}(M \times \text{Prop})$ that gives as value for each context i the set Ψ up (i) of all psychological states that are expressed by the speaker in that context according to possible interpretation $\mathcal{M}$. If $m \in M$ and $P \in \text{Prop}$, $<m,P>$ represents here the psychological state of type m with the propositional content P. Each of the sets Ψ up (i) is indexed by the set Z of integers. $<m,P> \in \Psi$ up (i) (k) if and only if the speaker expresses with degree of strength k the psychological state $<m,P>$ in the context i. By definition, $i\Pi^k_S P$ if and only if $<m,P> \in \Psi$ up (i) $<k>$ for some $m \in M$.

7) Φ is the set of all illocutionary forces expressible in L. It is the smallest subset of $(2^I)^{\text{Prop}}$ that contains for each illocutionary point Π the primitive illocutionary force F such that $F(P)(i) = 1$ if and only if $i\Pi^o P$ and that contains also for each propositional content condition $\theta \in (\mathfrak{S}(\text{Prop}))^I$, for each preparatory condition $\Sigma \in (\mathfrak{S}(\text{Prop}))^{I \times \text{Prop}}$, for each sincerity condition $\Psi \in (\mathfrak{S}(M \times \text{Prop}))^{I \times \text{Prop}}$, for each mode of achievement $\mu \in 2^\Pi$ and for each illocutionary force $F \in \Phi$, the new derived forces $[\theta]F$, $[\Sigma]F$, $[\Psi]F$, $[\mu]F$, $[+1]F$ and $[-1]F$ when these have the same illocutionary point as F. (A force F′ derived from a force F has the same illocutionary point as F if and only if the intersection of all points Π such that if $F'(P)(i) = 1$ then $i\Pi P$ is identical with the intersection of all points Π such that if $F(P)(i) = 1$ then $i\Pi P$.)
$[\theta]F$ is the function from Prop in 2^I such that $[\theta]F(P)(i) = 1$ if and only if $F(P)(i) = 1$ and $P \in \theta(i)$. $[\Sigma]F$ is such that $[\Sigma]F(P)(i) = 1$ if and only if $F(P)(i) = 1$ and $\Sigma(i,P) \subseteq \Sigma$ up (i). $[\Psi]F$ is such that $[\Psi]F(P)(i) = 1$ if and only if $F(P)(i) = 1$ and $\Psi(i,P) \subseteq \Psi$ up (i), $[\mu]F$ is such that $[\mu]F(P)(i) = 1$ if and only if $F(P)(i) = 1$ and $\mu(i,P) = 1$.

$[+1]F$ is such that $[+1]F(P)(i) = 1$ if and only if $F(P)(i) = 1$, $i\Pi_F{}^{\text{degree}\,(F)+1}P$ and $\Psi_F(i,P) \subseteq \Psi up(i)$ $(\eta(F)+1)$ when degree $(F) = \eta(F)$. Otherwise, $[+1]F(P)(i) = 1$ if and only if $F(P)(i) = 1$ and $\Psi_F(i,P) \subseteq \Psi up(i)$ $(\eta(F)+1)$ where Π_F, degree (F), Ψ_F and $\eta(F)$ are defined as follows:

The illocutionary point Π_F of a force F is the conjunction of all illocutionary points Π such that if $F(P)(i) = 1$ then $i\Pi P$. The degree of strength of the illocutionary point, degree (F), of a force F is the greatest integer k such that if $F(P)(i) = 1$ then $i\Pi_F^k P$. The sincerity conditions Ψ_F of a force F are the union of all sincerity conditions $\Psi \in (\mathcal{O}(M \times \text{Prop}))^{I \times \text{Prop}}$ such that if $F(P)(i) = 1$ then $\Psi(i,P) \subseteq \Psi up(i)$, and the degree of strength of the sincerity conditions $\eta(F)$ of a force F is the greatest k such that if $F(P)(i) = 1$ then $\Psi_F(i,P) \subseteq \Psi up(i)$ (k). Finally, $[-1]F$ is that function such that $[+1][-1]F = F$.

The other components of each force F are defined as in section I.[8]

8) Finally $\| \, \|$ is a function which associates with each well-formed formula X of L its meaning in L according to the possible interpretation $\mathcal{M}$. This function satisfies the following clauses:

(i) If f is an illocutionary force marker of the lexicon of L, $\| f \| \in \Phi^I$ is a function which gives as value for each context i the primitive illocutionary force $\| f \|_i$ expressed by f with respect to i under $\mathcal{M}$. By definition, $\| \vdash \|_i$ is the primitive assertive force, $\| \perp \|_i$ is the primitive commissive force, $\| ! \|_i$ is the primitive directive force, $\| T \|_i$ is the primitive force of declaration and $\| + \|_i$ is the primitive expressive force in all possible interpretations.

(ii) If h^θ is a modifier of illocutionary force markers expressing an operation which consists in adding a propositional content condition, then $\| h^\theta \| \in (\Phi^\Phi)^I$ is a function such that for some propositional

[8] Each illocutionary force F has in my theory a normal form [mode (F)] $[\Psi_F]$ $[\Sigma_F]$ $[\text{Prop}_F]$ $[\eta(F)]F^*$ where F^* is the primitive force with the illocutionary point Π_F and where $[\eta(F)]F^* = F^*$ if $\eta(F) = 0$, $[\eta(F)]F^* = \underbrace{[+1] \ldots [+1]}_{k \text{ times}} F^*$ if $\eta(F) = +k$ and $[\eta(F)]F^* = \underbrace{[-1] \ldots [-1]}_{k \text{ times}} F^*$ when $\eta(F) = -k$.

content condition $\theta \in (\mathcal{O}(\text{Prop}))^I$, for all $i \in I$, $\|h\|_i(F) = [\theta]F$. Similarly $\|h^\Sigma\| \in (\Phi^\Phi)^I$ is a function such that for some preparatory condition $\Sigma \in (\mathcal{O}(\text{Prop}))^{I \times \text{Prop}}$, $\|h^\Sigma\|_i(F) = [\Sigma]F$. $\|h^\Psi\| \in (\Phi^\Phi)^I$ is a function such that for some sincerity condition $\Psi \in (\mathcal{O}(M \times \text{Prop}))^{I \times \text{Prop}}$, $\|h^\Psi\|_i(F) = [\Psi]F$. $\|h^\mu\| \in (\Phi^\Phi)^I$ is a function such that for a mode of achievement $\mu \in 2^\Pi F$, $\|h^\mu\|_i(F) = [\mu]F$. Finally $\|+\|$ and $\|-\|$ are functions of $(\Phi^\Phi)^I$ such that $\|+\|_i(F) = [+1]F$ and $\|-\|_i(F) = [-1]F$.

(iii) If h f is a complex illocutionary force marker of L, $\|hf\| \in (2^I)^{\text{Prop}^I}$ is that function which gives as value for each context i the illocutionary force $\|h\|_i(\|f\|_i)$.

(iv) If p is a propositional constant of the lexicon of L, then $\|p\| \in \text{Prop}^I$ is a function which gives as value for each context i the proposition $\|p\|_i$ expressed by p in i according to $\mathcal{M}$.

(v) If d_n is a propositional connective of degree n, $\|d_n\| \in (\text{Prop}^{\text{Prop}^n})^I$ is that function which gives as value for each context i the n-ary operation on propositions $\|d_n\|_i$ expressed by d_n in that context according to $\mathcal{M}$. The logical constants are interpreted in the usual way. Thus, for example $\|\sim\|_i \in \text{Prop}^{\text{Prop}}$ is a function such that $[\|\sim\|_i(P)](w) \neq [P](w)$ in all possible interpretations and similarly for the other logical connectives.

(vi) If $d_n p_{m1} \ldots p_{mn}$ is a complex clause of L, then $\|d_n p_{m1} \ldots p_{mn}\| \in \text{Prop}^I$ is a function such that $\|d_n p_{m1} \ldots p_{mn}\|_i = \|d_n\|_i(\|p_{m1}\|, \ldots, \|p_{mn}\|_i)$.

(vii) If f(p) is a sentence of L, then $\|f(p)\| \in (2^I)^I$ is the function such that for each context i, $\|f(p)\|_i = \|f\|_i(\|p\|_i)$.

(viii) Finally, $\|\hat{}f(p)\| \in \text{Prop}^I$ is the function such that for each context i, $\|\hat{}f(p)\|_i$ is a proposition such that $[\|\hat{}f(p)\|_i](w_i) = 1$ if and only if $\|f(p)\|_i(i) = 1$.

The fundamental semantic notions of illocutionary logic are now defined as follows:

The illocutionary act expressed by a sentence f(p) with respect to a possible context of utterance i in the possible interpretation $\mathcal{M}$ is the function $\mathscr{A} \in 2^I$ such that for each context $j \in I$, $\mathscr{A}(j) = \| f(p) \|_i (j)$. This act $\mathscr{A}$ is *successfully performed* in a context j according to $\mathcal{M}$ if and only if $\mathscr{A}(j) = 1$ in $\mathcal{M}$. An utterance of a sentence f(p) of L in a context i is *successful* under a possible interpretation $\mathcal{M}$ if and only if $f(p) \in \gamma(i)$ and $\| f(p) \|_i (i) = 1$. An illocutionary act $\mathscr{A} \in 2^I$ is *literally performed* in a context of utterance i under $\mathcal{M}$ if and only if there is a successful utterance in that context of a sentence f(p) such that $\| f(p) \|_i = \mathscr{A}$. An attempt by the speaker to perform an illocutionary act $\mathscr{A}$ *fails* in a context of utterance i under $\mathcal{M}$ if and only if for some sentence f(p), $f(p) \in \gamma(i)$, $\| f(p) \|_i = \mathscr{A}$ and $\mathscr{A}(i) = 0$.

The illocutionary act expressed by a sentence f(p) with respect to a possible context of utterance i *is satisfied* in a context j under the possible interpretation $\mathcal{M}$ if and only if $[\| p \|_i] (w_j) = 1$. Otherwise it is not satisfied in that context under $\mathcal{M}$.

A set of sentences Γ *illocutionarily entails* a sentence f(p) (for short: $\Gamma \Vdash f(p)$) if and only if in all possible interpretations $\mathcal{M}$ for all possible contexts i if, for all $f'(p') \in \Gamma$, $\| f'(p') \|_i (i) = 1$ then $\| f(p) \|_i (i) = 1$.

Two sentences f(p) and f'(p') are *illocutionarily equivalent* (for short: $f(p) \equiv f'(p')$) if and only if $f(p) \Vdash f'(p')$ and $f'(p') \Vdash f(p)$. A set of sentences Γ *truth-conditionally entails* a sentence f(p) (for short: $\Gamma \models f(p)$) if and only if in all interpretations $\mathcal{M}$ for L for all possible contexts of utterance i, if for all $f'(p') \in \Gamma$ $[\| p' \|_i] (w_i) = 1$ then $[\| p \|_i] (w_i) = 1$. Two sentences f(p) and f'(p') are *truth-conditionally equivalent* if and only if $f(p) \models f'(p')$ and $f'(p') \models f(p)$. A set of sentences Γ is *illocutionarily consistent* if and only if there exists at least one possible interpretation $\mathcal{M}$ with a possible context of utterance i such that for all $f(p) \in \Gamma$, $\| f(p) \|_i (i) = 1$. Γ is *truth-conditionally consistent* if and only if there exists at least one possible interpretation with a possible context of utterance i such that for all $f(p) \in \Gamma$, $[\| p \|_i] (w_i) = 1$. A sentence f(p) is *illocutionarily analytic* in L if and only if either in all possible interpretations $\mathcal{M}$ for L for all possible contexts of utterance i if $f(p) \in \gamma(i)$ then $\| f(p) \|_i (i) = 1$ or in all possible interpretations $\mathcal{M}$ for all contexts i if $f(p) \in \gamma(i)$ then $\| f(p) \|_i (i) = 0$. Similarly a sentence f(p) is *truth-conditionally analytic* if and only if either it is

satisfied in all possible contexts of utterance of all possible interpretations $\mathcal{M}$ for L or it is not satisfied in any possible context of utterance of any possible interpretation for L. An illocutionary act $F_1(P_1)$ has *stronger conditions of success* than another act $F_2(P_2)$ in a possible interpretation $\mathcal{M}$ if and only if, for all possible contexts of utterance i of $\mathcal{M}$, if $F_1(P_1)$ (i) = 1 then $F_2(P_2)$ (i) = 1. (In symbols: $F_1(P_1) \rhd_{\mathcal{M}} F_2(P_2)$.) $F_1(P_1)$ has *stronger conditions of satisfaction* than $F_2(P_2)$ in $\mathcal{M}$ if and only if in all possible interpretations, for all possible contexts of utterance i, if $[P_1]$ $(w_i) = 1$ then $[P_2]$ $(w_i) = 1$.

The meaning of a sentence f(p) of L is defined by quantifying over its evaluations in all possible interpretations. The *meaning of a sentence* f(p) in the language L is the function whose domain is the class of all possible interpretations and which gives as value for each interpretation $\mathcal{M} = <I, W, M, Prop, [\,], \Sigma up, \Psi up, \Phi, \|\,\|>$ the meaning $\|f(p)\|$ that the evaluation function $\|\,\|$ associates with that sentence in that interpretation. In case two sentences f(p) and f′(p′) have the same meaning in L, I will write $f(p) = f'(p')$.

The formal semantics for illocutionary force is a semantics of literal meaning that identifies speaker meaning with sentence meaning in all possible contexts of utterance. It adopts the convention that a speaker who uses a sentence in a context of utterance speaks literally and seriously and consequently attempts to perform the illocutionary act expressed by that sentence in that context. This convention is stated formally by the following postulate that identifies the primary illocutionary act of each utterance with the literal illocutionary act.

The postulate of literality.

In all possible interpretations $\mathcal{M}$ for L, if F(P)(i) = 1 in $\mathcal{M}$ then there exists a sentence $f(p) \in \gamma(i)$ such that, for all j, $\|f(p)\|_i(j) = 1$ only if F(P)(j) = 1. According to this postulate, the illocutionary act literally performed in a context of utterance has stronger conditions of success than all other illocutionary acts performed by the speaker in that context. In a semantics where speaker meaning and sentence meaning coincide, there are only two possible ways to perform an illocutionary act F(P) in a context of utterance namely either literally by uttering a sentence that expresses that act with respect to that context or non-directly by uttering a sentence that expresses an act with stronger conditions of success. Other cases of non-literal speech-acts such as indirect speech-acts, metaphors and irony cannot be analyzed in this

semantics but require a more general semantics of speaker meaning. (9)

V. *Semantic laws of illocutionary logic*

The purpose of this last section is to enumerate a few semantic laws that hold for illocutionary entailment. Most of these laws are obvious consequences of the definition of the structure of a possible interpretation for L.

1. *Any sentence h f(p) with a syntactically complex illocutionary force marker illocutionarily entails or is illocutionarily entailed by the simpler sentence f(p).*
In particular h f(p) $\Vdash$ f(p) when h $\neq -$ and f(p) $\Vdash$ h f(p) when h $= -$. Thus for example "Please come!" $\Vdash$ "Come!" and "Frankly, it is raining" $\Vdash$ "It is raining". This semantic law follows from the fact that any application of an operation on illocutionary forces to a force F generates a new force F′ such that all illocutionary acts of the form F′(P) either have stronger or have weaker conditions of success than the corresponding illocutionary acts of the form F(P). Thus in particular $[\theta]\,F(P) \trianglerighteq_{\#} F(P)$, $[\Sigma]\,F(P) \trianglerighteq_{\#} F(P)$, $[\Psi]\,F(P) \trianglerighteq_{\#} F(P)$, $[\mu]\,F(P) \trianglerighteq_{\#} F(P)$ $[+1]\,F(P) \trianglerighteq_{\#} F(P)$ and $F(P) \trianglerighteq_{\#} [-1]\,F(P)$.
Incidentally, the corresponding semantic law does not hold for truth-conditional entailment. If d is a unary propositional connective, it is not generally the case that a sentence of the form f(dp) truth-conditionally entails or is truth-conditionally entailed by the simpler sentence f(p).

2. *Any performative sentence $T\,\hat{}\,f(p)$ illocutionarily entails the sentence f(p).*
$T\,\hat{}\,f(p) \Vdash f(p)$.
Thus for example "I ask you whether it is raining" $\Vdash$ "Is it raining?", and "I request you to come" $\Vdash$ "Please, come!". This law is based on the meaning postulate governing the declarative

(9) This semantics is outlined in my unpublished paper "Non-literal illocutionary acts and conversational implicatures".

illocutionary point. Its converse by the way is not valid because a speaker can perform literally an illocutionary act without declaring that he is performing that act. Thus $f(p) \not\Vdash T^{\wedge} f(p)$. The performative hypothesis according to which each non-performative sentence has the same logical form as a performative sentence is then false in the semantics for illocutionary forces. The sentence "Please, come!" does not have the same logical form as the performative sentence "I request you to come" because it does not illocutionarily entail that sentence. Although logically connected these two sentences are not illocutionarily equivalent.

3. *Any sentence T(p) illocutionarily entails the corresponding assertive sentence ⊢(p).*
$T(p) \Vdash \vdash(p)$.
Thus for example the performative sentence "I order you to leave the room" illocutionarily entails the assertive sentence "I am ordering you to leave the room". This law is based on the assertive commitment in the achievement of the declarative point. The two senses of the indicative mood are thus logically connected.

4. *Any sentence illocutionarily entails the expressive sentence that corresponds to it.*
The expressive sentence corresponding to a sentence f(p) is of the form $h^{\Psi f} \dashv (p)$ where $h^{\Psi f}$ is a modifier of illocutionary force markers expressing the operation which consists in adding the sincerity conditions of the force expressed by f. Thus if for all i in all possible interpretations, $\| h^{\Psi f} \|_i (F) = [\Psi_{\|f\|_i}] F$, then $f(p) \Vdash h^{\Psi f} \dashv (p)$. For example the sentence "I supplicate you to stop doing this" illocutionarily entails the sentence "If only you would stop doing this".

5. *The sentence used by the speaker in a context of utterance illocutionarily entails all sentences that express a successful illocutionary act in that context.*
$\gamma(i) \Vdash f(p)$ when $\| f(p) \|_i (i) = 1$.
This law is a consequence of the postulate of literality and is used in the demonstration of the validity of the axiom of foundation for illocutionary commitment:

6. *The axiom of foundation.*
If $F(P)(i) = 1$ then $\|\gamma(i)\|_i(i) = 1$ and, for all $F'(P')$, if $F'(P')(i) = 1$ then $\|\gamma(i)\|_i \rhd_{\mathcal{M}} F'(P')$.
In each context of utterance the speaker performs all the illocutionary acts that he performs in that context by way of performing literally the illocutionary act expressed by the sentence that he utters. This semantic law is an axiom of foundation because if says that all chains of illocutionary commitments of a speaker have a unique starting point.

7. *If a sentence illocutionarily entails another sentence, it does not necessarily expresses ipso facto an illocutionary act with stronger conditions of success than the act expressed by the other sentence.*
From $f(p) \Vdash f'(p')$ it does not necessarily follow that, for all $\mathcal{M}$, $\|f(p)\|_i \rhd \|f'(p')\|_i$. A sentence $f(p)$ illocutionarily entails another sentence $f'(p')$ if and only if in all contexts of utterance of all possible interpretations where it is evaluated as expressing an illocutionary act that is successfully performed, $f'(p')$ is also evaluated as expressing an illocutionary act that is performed. It is not a necessary condition for the illocutionary entailment $f(p) \Vdash f'(p')$ that $f(p)$ expresses in all possible interpretations with respect to each possible context of utterance an illocutionary act that is stronger than the one expressed by $f'(p')$ in that context, because this requires to consider the success values of the illocutionary acts expressed by these sentences in other contexts of utterance than those where they are evaluated. Thus for example the sentence "I assert that the American football team was defeated yesterday" illocutionarily entails the sentence "I report that the American football team was defeated yesterday" because their clause expresses with respect to each possible context of utterance a proposition that represents a past state of affairs with respect to the moment of the utterance and because a report is an assertion with the additional propositional content condition that the propositional content represents a past or present state of affairs. However, if the proposition expressed by the clause of these sentences in a context of utterance i is necessarily past with respect to that context of evaluation it is not past with respect to another context j taking place for example one week earlier. On the contrary, that proposition is future with respect to the context j and could consequently be asserted or predicted but not reported in that context.

Illocutionary entailment as I define it in this paper is not a classical logical entailment because I do not quantify over the success values in all possible contexts of utterance of the illocutionary acts expressed by a sentence but I consider only their success values in the contexts of evaluation. A sentence f(p) *illocutionarily entails in the classic sense* another sentence f'(p') (for short: $f(p) \trianglerighteq f'(p')$) if and only if in all possible interpretations for all contexts i. and j if $\| f(p) \|_i (j) = 1$ then $\| f'(p') \|_i (j) = 1$. Incidentally the truth-conditional entailment that I define in this paper is also not a classical truth-conditional entailment where one quantifies over the truth-values of the expressed propositions in all possible worlds and not only on their truth-values in the worlds of the contexts where the sentences are evaluated. ([10])

An important corollary of the preceding semantic law is the following:

8. *Illocutionary equivalence is weaker than synonymy.*
It does not follow from $f(p) \Vdash f'(p')$ and $f'(p') \Vdash f(p)$ that $f(p) = f'(p')$. Thus for example the two sentences "I predict that he will come tomorrow" and "I assert that he will come tomorrow" are illocutionarily equivalent but are not synonymous.

9. *Classical illocutionary entailment is a relation of partial ordering.*
$f(p) \trianglerighteq f(p)$; if $f(p) \trianglerighteq f'(p')$ and $f'(p') \trianglerighteq f''(p'')$ then $f(p) \trianglerighteq f''(p'')$.
If $f(p) \trianglerighteq f'(p')$ and $f'(p') \trianglerighteq f(p)$ then $f(p) = f'(p')$.
Classical illocutionary equivalence constitutes the criterion of synonymy. According to the axiom of extensionality, two acts with the same conditions of success are identical and consequently two sentences expressing such acts with respect to all possible contexts of utterance have the same meaning. Here are a few examples of sentences that have the same meaning: "Is it raining?" = "Please, tell me whether it is raining or not", "I request you humbly to come" = "I beg you to come". Because to beg is to request humbly, the two last sentences are of the form $T \wedge h^{\mu} f(p)$ and $T \wedge f'(p)$ where $\| h^{\mu} \|_i (F) = [\text{mode} \| f' \|_i)] F$ by definition. Consequently $\| h^{\mu} f \|_i = \| f' \|_i$ so that these sentences have the same meaning. On the other hand the

([10]) The notion of truth conditional entailment of this paper is similar to the one defined by D. Kaplan (1979) in his logic of demonstratives.

two sentences "Is it raining?" and "Please, tell me whether it is raining or not" have the same meaning because their markers express illocutionary forces associating with the proposition expressed by their clause illocutionary acts with the same conditions of success. In the semantics for illocutionary forces, it does not follow from the identity of two elementary illocutionary acts $F_1(P_1)$ and $F_2(P_2)$ that their illocutionary forces F_1 and F_2 are identical. Thus for example if as in the present case an illocutionary force F_1 is obtained from another one F_2 by adding one propositional content condition (namely that it represents a future speech-act of the hearer to the original speaker) and if P is a proposition that satisfies this condition with respect to all contexts where P satisfies the propositional content conditions of F_2 (in this case P represents a future assertion of the hearer in all contexts where it represents a future action of the hearer), then the illocutionary acts $F_1(P)$ and $F_2(P)$ have the same conditions of success and are identical. An illocutionary act of the form F(P) is *not* an ordered pair of the form $<F,P>$. In the performance of an illocutionary act of the form F(P) the force F is applied on the propositional content P and just as in arithmetics different functions give sometimes for certain arguments the same values, in illocutionary logic different forces give sometimes as value for some propositional contents identical illocutionary acts with the same conditions of success.

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