10. The Semantics of Imperatives

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1 Introduction

Imperatives are typically taken to express commands, at least as a first approximation. Syntactically, some languages mark imperative with a particular mood. In English, they are essentially subject-less sentences with a bare verb stem. For example (1) expresses the command that someone shut the door, or that the door be shut.

(1) “Shut the door!”

The target of the command is not specified in the linguistic expression. Other languages may permit a subject, and English allows the intended target to be affixed “John, shut the door!”, “Shut the door, John!”. In the case of (1), one would anticipate that the addressee is expected to comply by performing an action that results in the door being shut.

Some sentences have the form of imperatives, but are not usually interpreted as overt commands. For example, (2) appears to express a wish or hope, or “optative”, (cf. “May you live long and prosper”). And (3), as a “(co)hortative”, expresses encouragement, or a proposal for joint action. Neither are commands as such (Schmerling, 1982; Mastop, 2005).

(2) “Live long and prosper!”
(3) “Let us sing!”

In this particular case, it might be argued that an ambiguity arises where some moods have no distinct syntactic formulation in English. Or that, in some cases at least, the nature of the verb may give a clue that something other than a command is intended. Imperatives normally only appear to express felicitous commands with verbs/predicates that describe things which can be changed by the agent concerned (Han, 1999).

But there are cases were it seems syntax alone cannot distinguish between (unconditional) commanding and non-commanding uses. For example, imperatives that have the appearance of commands can be used to provide answers to certain kinds of questions, as in (4).

(4) (a) “How do I get to Harlem?”
(b) “Take the A Train” (cf. Kratzer, 1981)

The different grounds for issuing an imperative, and the context in which they appear, and the precise nature of the verb, may all play a role in determining its status as a command, suggestion (“Try asking Peter!”) or advice (“Take care!”), invitation (“Come to our party!”), request or permission (“Have some fruit!”), hortative (“Let’s go!”) (Sadock, 1974; Schmerling, 1982; Mastop, 2005) or instruction (“Carefully remove the lid”) (Sadock, 1974). There may be other dimensions in which imperatives might be distinguished, such as

1 In some cases, an agent other than the addressee may be expected to perform the appropriate action or activity.
whether the “command” is being issued in the interests of the speaker, or the addressee (Hamblin 1987).

One question to consider is whether a formal analysis of the semantics of imperatives should address these distinct uses and characterisations from the outset, as an essential, inseparable part of their meaning. The alternative is to consider them as having a core meaning (e.g. as a command, or at least something that has satisfaction conditions). How an agent then chooses to act upon them (or intend to have them acted upon) may then vary depending on various contextual, pragmatic factors, including the agents’ goals desires (or perceived desires).

For example, some combinations of the context and agents desires may lead to some imperatives being interpreted as granting permission rather than imposing an obligation, either because commands appear to conflict with themselves or pre-existing norms (Portner 2010 and cf. Lewis 1979; Kamp 1979), or because of other considerations that transform the command into some other kind of speech act (see Charlow 2011, for example).

Although there may be some counter arguments, a case can be made that it is appropriate to treat imperatives as semantically expressing commands (or at least, expressions that can be “satisfied”). This is akin to the way that assertions are assumed to have a core meaning that is intimately related to propositions (and truth). In effect we can follow Huntley (1984), Portner (2007), Kaufmann (2012) and others in assuming that different speech act classifications need play no role in the core analysis.

### 1.1 Imperatives and Entailment

One key issue is that, as with questions (Chapter 9, “The Semantics of Question”), the core meaning of imperatives does not appear to be truth-conditional in nature, at least not in any straight-forward sense: it seems inflictious to assert “it is the case that ‘shut the door!’”. Intuitively, however, there appears to be some notion of entailment between imperatives. For example, the commands to “close the window!” and “shut the door!” appear to have similar import as the single command “close the window and shut the door!”, suggesting that there is a pattern of entailment as in (5).

(5) “close the window!” “shut the door!”

Therefore: “close the window and shut the door!”

Furthermore, there appear to be entailments that relate propositions and imperatives as in the practive inferences of Aristotle.

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2 “In the case of declarative sentences, which similarly have the potential for a number of different illocutionary uses, semanticists have few reservations about abstracting from the variety of such uses and working with a propositional core meaning identified as common to them all.” (Huntley 1984).
(6) “Heal the sick!” “John is sick”

Therefore: “Heal John”

This may seem odd if we assume that such entailments are always concerned with judgements that are essentially truth conditional in nature [Jørgensen 1937–38], and that the entailment here is characterising the preservation of truth (that is, if the premises are true, then the conclusion is true).

A number of questions can be posed. What is the most appropriate notion of “entailment” for imperatives? What is the nature of the judgement involved that is being preserved if it is not that of truth? Is there more than one such notion? Given a particular notion of entailment, what are our intuitions about which rules should be supported? Are our intuitions coherent, or do they have counter-intuitive or paradoxical consequences? Can they be said to form a logic as such? Are the same notions of entailment applicable for all pragmatic uses of imperatives?

We may also wonder what the appropriate interpretation of an imperative is in itself. For example, are they related directly or indirectly to propositions? Are they (disguised) modal expressions, perhaps related to deontic expressions? Are they constraints, or preferences, over the space of possible eventualities? Can we consider the logical entailment patterns of imperatives independently of any specific interpretation? If we wish to take seriously patterns entailment of the form in (5), but also accept that we ought to refrain from making judgements of truth about imperatives, then we may consider ourselves to be under an obligation to reflect on the nature of the judgements involved.

1.2 Structure of this Chapter

In this chapter we do not intend to provide a comprehensive compositional analysis of all semantic and pragmatic details of imperatives. Just as propositional logic imbues sentential connectives with meaning in terms of truth, the goal here will be to determine the “meaning” of sentential connectives when used to combine imperatives, given an appropriate “proxy” for truth.

We will first consider how imperatives may be combined with each other, and with propositions (Section 2). The goal will then be to consider how the meaning of the more complex imperative relates to the constituent expressions in these examples (Section 5). Along the way we will review some of the conundrums and paradoxes presented in the literature (Section 3), and preëxisting analyses of imperatives (Section 4). An argument will be made that some of the difficulties identified in the literature arise because different kinds of judgements are conflated.

3 For example, they might be performative obligations [Kaufmann 2012].
2. Examples of imperatives

2.1 Introduction

As mentioned above (Section 1), imperatives need not be exclusively interpreted as commands. When reflecting on various examples of imperatives, all kinds of pragmatic uses could be considered. Here, however, we will idealise the data, and generally treat imperatives as having a command-like interpretation. This can be seen to be akin to idealising assertoric utterances as proposition-like, even though pragmatically they may support a broader range of interpretations.

There will be some cases, however, were it appears unavoidable to consider imperatives as contributing to something other than a command, such as a wish, threat or promise, as with pseudo-imperatives (Section 2.6).

Imperatives can be combined with each other through disjunction (7b, and Section 2.4) and conjunction (7a, and Section 2.3). They can also be negated (7c, and Section 2.2) — although this does not indicate the absence of a command — and combined with propositions in certain limited ways, as in the case of conditional imperatives (7d, Section 2.5), and so-called pseudo imperatives (Clark, 1993) (as in 7e, 7f, Section 2.6).

(7) (a) “Close the window and shut the door!”
(b) “Watch television, or go to the beach!”
(c) “Don’t watch television!”
(d) “If you have finished your homework, do the washing up!”
(e) “Have another drink, or you will be thirsty!”
(f) “Have another drink and you will be happy!”
(g) “Have another drink and you will die!”

In order to determine the nature of the semantic interpretation of imperatives, we need to consider our intuitions about the meanings of these more complex expressions, and how they relate to the meanings of their constituent parts. We also have to consider whether those cases in which an imperative is combined with a proposition (i.e., e.g.) are imperatives as such. We will now considered some of these cases in more detail.

Here we will consider these different composite imperatives in isolation. But a competent analysis should predict appropriate interpretations when they are combined. For example, the analyses of disjoined imperatives and negated imperatives should predict appropriate interpretations for negated disjoined imperatives. We may also favour a parsimonious account that captures, or predicts, the appropriate entailment behaviour for the connectives in all contexts in which they may appear, regardless of the kinds of entities that are being combined.

4 Pseud imperatives are also referred to as “imperative-like conditionals” Davies (1986).

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Here we are considering relatively straightforward basic imperatives. We do not consider cases where an imperative may have a subject that differs from the addressee (Schmerling, 1982; Kaufmann, 2012; Zanuttini, 2008).

2.2 Negation

If we negate an imperative, the result is an imperative. The negation does not signal the absence of an imperative.

(8) “Do not eat the cheese!”

The example (8) does not mean that you are simply not being commanded to eat cheese; it is an imperative that requires you to refrain from eating cheese. If imperative force is expressed in terms of some sentential operator, this suggests that such an operator has wide scope over any negation operator.

If we were to take the view that imperatives are concerned with specifying desirable actions, then we might need to take care with negated imperative if we wish to avoid difficulties in formulating the notion of a negative action.

As with all the sentential operators that can be applied to imperatives, ideally we need any formal account to be able to deal with all such cases systematically, regardless of whether or not they occur in the context of other operators.

2.3 Conjunction

Consider the cases of conjunctive imperatives (9).

(9) (a) “Turn on the light and close the curtains!”
(b) “Jump out of the window and land on the mattress!”

The obvious question is whether these are simply equivalent to the case where two distinct commands are issues, one for each conjunct (10).

(10) (a) “Turn on the light!”, “Close the curtains!”
(b) “Jump out of the window!”, “Land on the mattress!”

While it seems acceptable to say that we can infer (9) from (10) — as in (5) — we may wonder whether we can independently infer the conjuncts in (10) from the conjuncts in (9). That is, while there may be some sense in which imperatives support conjunction introduction, can they also be seen to support conjunction elimination, as in (11).

(11) “Jump out of the window and land on the mattress!”
“Jump out of the window!”
There have been arguments that such entailments should not hold, as partial satisfaction may not be desirable, and might even be ruled out “... But don’t just jump out of the window, ...!” without contradicting the conjoined imperative (Jackson, 1985). The person issuing the command may never dream of uttering “Jump out of the window!” without qualification. Whether we support this view may depend on the precise nature of the proposed entailment, in particular the nature of the judgements involved (e.g. are such rules concerned with what has been commanded, or with “satisfaction” conditions).

One explanation for this behaviour is that “and” in these contexts has a sequential interpretation, like “and then”. In this case it could interpreted as specifying a composite action. It is this composite action that is desired. If “A and then B!” is desired, it does not mean that A or B are desired without qualification. In effect, this sequential interpretation/use of “and” does not, in general, support conjunction elimination. Following Charlow (2011), the non-sequential uses of “and” might be regarded as some form of “discourse-level” conjunction.

2.4 Free choice and weak disjunction

When occurring with disjunction, imperatives typically appear to be interpreted as some form of (forced) choice as to how they are to be satisfied (Kamp, 1973, 1979). As with other connectives, a disjunction might occur at the sentential level, or within some constituent phrase.

(12) “Go to the beach, or play in the park!”
(13) “Have some apple or bananas!”
(14) “Sleep on the bed, or on the couch!”

It appears that the recipient of such imperatives is expected to decide which disjunct to satisfy, for example to go to the beach, or to play in the park. The choice often appears to be exclusive; to both go to the beach and play in the park might not properly satisfy (12). It could be said that imperatives with an indefinite noun phrase also present a form of free choice. With (15), the choice is in which apple to eat.

(15) “Eat an apple.”

Formally, this might correspond to the disjunctive imperative

(16) “Eat apple A or eat apple B or eat apple C or ...”

5 Such an analysis might explain some of the examples of Starr (2012), as in “Go home and I’ll go to the grocery store” where they are not interpreted as threats or promises (cf. Section 2.6).
6 There are cases of free choice permission where the inclusive reading does appear natural (Barker, 2010).
Again, it would seem questionable whether eating more than one apple would be a felicitous way of complying with the imperative.

There may be cases where disjunction could be considered to provide a degree of underspecification to the precise command. That is, the authority in question intends there to be a specific command, but the details are not (yet) clear. In this case, the choice might belong to the issuer of the imperative rather than the recipient. These are sometimes referred to as weak disjunctive readings. They may appear more natural when their utterance is forced, as in answer to a question, or if some other external means of making the choice is indicated, as in (17) and (18).

(17) (a) “What do I need to do?”
(b) “Buy some teak or mahogany, depending on which is in stock.”

(18) (a) “Which way should I go?”
(b) “Go north over the mountains or south along the coast [it depends on the time of year].”

The latter case might be taken to be a form of conditional command (Section 2.5), perhaps involving implicit “modal subordination” (Kratzer 1981, 1991) (Section 4.3 and Chapter 8, “Conditionals and Modality”). One question is whether expressions involving disjunction should always have the same import regardless of the level at which the disjunction occurs.

(19) “Have some tea or have some coffee!”
(20) “Have some tea, or coffee!”
(21) “Have some tea or coffee!”

Given an imperative, we may have a free choice in how to satisfy it, and we might assume that we have been given implicit permission to take actions necessary to satisfy it. With disjunction we may assume that there is permission to satisfy either disjunct. Such permissive readings also arise with regular imperatives, not just disjunction.

(22) “Take a piece of fruit!”
⇒ “You may take this apple.”/“You may take that pear.” (example from Portner 2010)

2.5 Conditional

A sentence of the form (23) is a conditional imperative.

(23) “If you see John, say hello!”

Or, for symmetry with the conjunction (Section 2.3), we might consider it to be a discourse level disjunction.
This may be interpreted as meaning that the consequent imperative becomes salient in the event that the antecedent is true. There are some pertinent questions. Do we take (23) to be an imperative regardless of the truth of the antecedent proposition, or does it just become an imperative in the event that the antecedent proposition is true? If it is not an imperative, then what kind of thing is it? If the entire construction is an imperative, then might there be other ways that it could be satisfied, for example by ensuring that that the antecedent is, and remains, false (for example, by avoiding John)?

While this might seem a perverse approach to satisfying (23), it may seem more natural with other examples, such as (24).

(24) “If you break the window, repair the damage.”

The intended mode of satisfaction may depend upon subjective value judgements about the antecedent and the consequent (cf. Pseudo imperatives, Section 2.6).

2.6 Pseudo imperatives

Like conditional imperatives, pseudo imperatives (Clark 1993) — or imperative-like conditionals (Davies 1986) — combine a propositional and imperative part as in (25).

(25) (a) “Take another step and I will kill you.”
(b) “Take another step or I will kill you.”
(c) “Have more fruit or you will become ill.”
(d) “Have more fruit and you will become ill.”
(e) “Have more fruit and you will get better.”

We may question whether these expressions are imperatives, some form of proposition, or perhaps even both. The salient interpretation appears to be dependent on the nature of the construction; whether it involves conjunction or disjunction, and whether the proposition is deemed to describe something good, or something bad (or rather, the relative desirability of the proposition compared to the cost of complying with the imperative).

In those cases where the propositional constituent describes something relatively bad, the pseudo imperatives characterise a threat; something unpleasant that will arise if the imperative is satisfied (in the case of conjunction) or not (in the case of disjunction). Those conjunctive cases with a positive proposition characterise a promise. It seems hard to form felicitous examples involving disjunction when the “outcome” is positive (26).

(26) “Have more fruit or you will get better.”

8 We may wonder whether it makes sense to ask what kind of thing it is if the antecedent is false.
On the face of it, only the disjunctive cases may be genuinely imperative in nature \cite{franke2005}. The conjunctive forms appear to be more like hypothetical propositions about possible outcomes rather than imperatives as such \cite{han1999}. This appears to be born out by languages that have overt imperative markings (such as Greek, Hebrew and Japanese, for example) where imperative marking is only felicitous for disjunctive cases. But even in the disjunctive case, it could be argued that there is still some propositional content – a form of "explanation" as to why it is appropriate to comply with the imperative – in addition to the imperative force.

As with conjunction between imperatives (and propositions), there may be distinct notions here, with both a "sequential" and "discourse level" interpretation (Section 2.3). A discourse level interpretation of (27) might mean just that there is an imperative (to go home) syntactically combined with a proposition, but with no intention to threaten or promise \cite{starr2012}.

(27) “\textit{You} go home, and I will go shopping.”

We may wonder whether there is a uniform analysis of conjunction that can obtain these different readings for different kinds of conjuncts (Section 4.1).

2.7 Relationship to Deontic Modals

Looking at English examples, with their bare verb stems, we might be tempted to consider “imperatives” to be expressions with an ellided deontic modal \cite{starr2012}, and where the source of the obligation/expectation is the speaker \textsuperscript{11}.

(28) (a) “\textit{I insist that you should} close the door”
(b) “\textit{I suggest that you ought to} turn on the light”

But other languages have an imperative-mood morphology that, syntactically at least, suggests the interpretation of imperatives as elliptic for deontic expressions may be inappropriate \textsuperscript{12}.

Imperatives also appear to be essentially performative in nature, at least in the case of commands. In such cases, the utterance of an imperative is the command. It seems that we cannot normally use imperatives to describe what commands are, or are not, currently in effect. In contrast, deontic expressions need not be performative; they can simply describe obligations (and

\textsuperscript{9} Bolinger \cite{bolinger} calls these examples \textit{conditions} and Russell \cite{russell} calls them \textit{conditional conjunctions}.
\textsuperscript{10} Charlow \cite{charlow} observes that there may be distinct levels of conjunction. A comma, or pause, following the conjunction appears to make this reading more accessible.
\textsuperscript{11} We are not considering cases where an imperative may have a subject that differs from the addressee \cite{schmerling1982,kaufmann2012,zamuttini2008}.
\textsuperscript{12} Although in general we may want to be cautious about using syntactic evidence as a definitive guide to semantic analysis.
permissions) that are currently assumed to be in force; they can be given truth conditions. The use of “insist” and “suggest” in (28) are intended to make the performative reading more salient.

Syntactically, deontic modals may express notions other than obligation (and permission), particularly if they occur with verbs other than activity predicates or stage-level statives, such as the individual stative in (29) (Han 1999).

(29) “You must be intelligent.”

In summary, if there is a semantic connection between imperatives and deontic modals, it may not be a direct one.
3 Problematic cases

Some potentially problematic issues have already been discussed relating to
the nature of imperatives, and the interpretation of imperatives when com-
bined with other imperatives and with propositions (Section 2), as with pseudo
imperatives (Section 2.6), conditionals (Section 2.5), conjunction (Section
2.3), and disjunction and free-choice (Section 2.4).

In this section we will mention some more specific problematic cases for
imperatives that arise in the literature on commands and obligations. In par-
ticular, here we review Jørgensen’s dilemma (Section 3.1) Ross’s Paradox
(Section 3.2) and The Good Samaritan (Section 3.3). The Good Samaritan,
was originally conceived as a puzzle for deontic logic, but is also relevant in
the case of imperatives. Other deontic puzzles may also be reformulated in
terms of imperatives, but we do not consider those here.

In addition to such puzzles, there is also a question about conflicting com-
mands. While the problem is perhaps not quite so stark for imperatives as it
is for truth-conditional deontic expressions (Lemmon, 1962) we need to to en-
sure that any formalisation of imperatives can entertain conflicting commands
without resulting in inconsistency in the logic itself.

Here we focus on issues that need to be considered by any proposed se-
monic account of imperatives as commands. There are other linguistic and
pragmatic issues — such as the interpretation of imperatives as things other
than commands, the role of commands and imperatives in discourse, the uni-
formity of analysis of connectives — which are not considered here (Section 2).
This is not to say that such questions are unimportant, merely that the pri-
mary focus here is on the problems that arise with the semantic interpretation
of imperatives as commands, rather than in their pragmatic use.

Whether this is a legitimate approach may boil down to a question of
the sense in which imperatives are considered to have a core semantic mean-
ing that is independent of specific use, and a potentially distinct pragmatic
interpretation that depends upon the context of use.

3.1 Jørgensen’s dilemma

As we have already seen (Section 2) it seems possible to reason with imper-
atives. A couple of examples of arguments that we might draw are given in
(30, 31) (Jørgensen, 1937–38).

(30) “Love your neighbour as you love yourself.” “Love yourself.”
(31) Therefore: “Love your neighbour.”

13 See for example Sartre’s Dilemma (Sartre, 1957–1946), Chisholm’s contrary to
duty obligations (Chisholm, 1963), and Plato’s Dilemma (Republic, I, 331c).
14 An alternative methodology would be to take the pragmatic interpretation as
the primary goal, but it may be difficult to formulate such an account without
appealing to context independent semantic notions.
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(31) “Keep your promises,” “This is one of your promises.”
Therefore: “Keep this promise.”

However, according to Jørgensen (1937–38) such kinds of inferences are usually only considered in the case of truth judgements. It might then be argued that this means imperatives have truth values. But this seems odd in most cases. There is then an apparent dilemma if imperatives support inferential behaviour while lacking truth values. This is taken further below (Section 3.2). Later we will argue that it is wrong to presuppose that rules of entailment need be restricted just to judgements of truth, as such (Section 5).

3.2 Ross’s Paradox

Ross (1941, 1945) considered the judgements of validity and satisfaction (cf. Beardsley, 1944). Essentially validity is concerned with what other imperatives may be implied when a command is issued, as in the disjunction introduction of (32), the assumption being that this follows the same pattern of entailment as propositional logic.

(32) “Post the letter!”
Therefore: “Post the letter or burn the letter!”

In contrast, satisfaction is concerned with the question of what other imperatives may be deemed to be satisfied when a given imperative is satisfied. In the case of (32), it is odd to say that the satisfaction of “Post the letter!” entails a command that can be satisfied by burning the letter (and moreover, a command that would be unsatisfied if the letter were left unburnt in the event that it could not be posted).

What we can conclude from this is that the desired patterns of entailment for satisfaction and validity appear to be at odds with each other, and are not characterised by the same patterns of behaviour.

When described in the literature, Ross’s so-called paradox is sometimes simplified to the question of whether or not disjunction introduction should be valid in a logic of imperatives; that is, whether a logic of imperatives should support entailments of the form given in (32). Some writers assume that Ross’s arguments suggest that disjunction introduction must be blocked. But this is not quite the point that Ross made. Whether the inference is appropriate depends on what judgements are being made about the imperatives. If we are taking about commanding (or validity, in Ross’s terminology), then disjunction introduction seems inappropriate. But if we are taking about satisfaction then it does not seem so problematic. Indeed, the real concern here is the nature of the judgements in the inferences. Ross notes the problem arises if we have a single system of inference that aims to capture the behaviour of distinct

\[15\] The argument is also applied in the case of deontic logic, where some take it to undermine the possibility of being able to reason with obligations.
kinds of judgements of validity (or commanding) and satisfaction. The supposed impossibility of a logic of imperatives stems from the conflation of two distinct judgements with distinct patterns of behaviour. If we are careful to distinguish between the judgements, perhaps by making them explicit, then some progress can be made towards a logic of imperatives.

Whether or not disjunction introduction is appropriate depends upon what kind of judgement we wish to formalise. Some of the arguments used to support the claim that disjunction introduction itself is the source of all these problems could be applied to propositional logic. For example given (33) we may infer (34).

\((33) \text{ “It is raining”} \)
\((34) \text{ “It is raining or it is snowing”} \)

But this does not mean that one way of satisfying the truth of \((33) \text{ “it is raining”} \) is to satisfy the second disjunct of \((34) \text{ “it is snowing”} \). That would be to misunderstand the nature of the judgements involved. Hare (1967) makes a similar point, arguing that disjunction introduction is fine if we consider it to be concerned with the notion of “compliance” while Ross’s Paradox might be characterised as a basic logical misunderstanding (Føllesdal & Hilpinen, 1971). It is perhaps more generous to note that in the absence of truth conditions for imperatives, we are free to determine what kinds of judgements are appropriate, whilst having a responsibility to avoid conflating fundamentally different notions.

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16 Rose argues that the different intuitions we have about the behaviour of validity and satisfaction suggests they ought not be conflated in a logical formalisation. Unfortunately he also appears to presuppose that any individual putative logical rules for imperatives must simultaneously satisfy our intuitions for both notions. That this appears impossible is the essence of the contradiction. This implicit presupposition might go some way to explaining the apparent confusion in the literature about the appropriate corollaries that should be drawn from Ross’s example. In this author’s view, the intuitively contradictory outcome of conflating distinct notions in a logic simply means that they should not be conflated. It does not mean there can be no formalisation. Nor does it mean that those patterns of behaviour on which judgements of validity and satisfaction diverge must then be excluded from the formalisation, regardless of our intuitions.

17 Hare also appeals to Gricean maxims, but these do not appear to be essential to this argument.

18 Arguably, some formalisations that seek to “avoid” Ross’s so-called paradox — adopting formal machinery that blocks disjunction introduction, for example — may have missed this point.

19 Portner (2010) uses the term warrant rather than entailment: an imperative does not warrant a disjunction between itself and another imperative.
3.3 Good Samaritan

The Good Samaritan paradox arises in the literature on deontic logic (Prior 1958). There are various forms of this paradox, and a number of other related problematic cases (e.g. the Gentle Murderer, Goble 1991). In imperative form, the paradox can be illustrated by (35).

(35) (a) “Help an injured man!”
(b) “If a man is injured, help him!”

These are intended to be general injunctions about how to behave when a particular circumstance arises. But in any formalisation of imperatives, we would prefer it if an analysis of (35) did not force us to conclude that we are under an obligation to injure a man in order to help him. In this case, this is a question as to whether the notion of what is being commanded should distribute to the constituent parts of the putative command.

Indeed, we might consider it best to act in a way that avoids the injury taking place, cf. (36), although in other cases this might not be relevant (37).

(36) “If you offend someone, apologise!”
(37) “If you see John, say hello!”

There is perhaps a hidden value judgement in the “Good Samaritan” paradox, and related examples. For example, in the context of cooking (38) does not have the same import as (39).

(38) “Use a clean knife.”
(39) “If a knife is clean, use it.”

Rather, the meaning might be more like (40).

(40) “When using a knife, first ensure it is clean.”

Whereas, as noted above, it would be surprising for (35) to be interpreted as meaning

(41) “When helping a man, first ensure he is injured.”

So, unlike the injured man example of the Good Samaritan paradox (35), we might regard (38) as expressing the expectation that the knife be cleaned in order for it to be used (Fox 2010).

Focus-related contextual effects and value judgements appear to be playing a role here (as with pseudo-imperatives, Section 2.6). With (38), arguably we

It might be argued that the different entailments arise because (38) is to be interpreted as an “instruction”, rather than a “command” as such. But it is not hard to conceive of a context in which it is issued as a command (or at least, where there are no independent criteria for determining the difference, other than the patterns of entailment that we seek to explain).
are more likely to be using, or expecting to use, a knife. The imperative is then most naturally interpreted as urging us to ensure that the knife is clean. Both using and cleaning a knife are typically morally neutral activities. In constrast, with (35), injuring a man is usually considered a bad thing to do, so the charitable preference is to assume there is no expectation that an act of injury to take place in order to satisfy the command.

While the Good Samaritan paradox itself highlights cases where some formalisations may be too strong, another conclusion to be drawn from this is that care needs to be taken to avoid assuming that specific examples — such as (35) — represent genuinely universal behaviour for all expressions of that form. We need to be aware of how moral preferences and other linguistic and non-linguistic aspects might influence and constrain our judgements about what can constitute appropriate satisfaction criteria.

One salient question is then whether a formal treatment of imperatives should encompass inferences that involve the value judgements and contextual factors that appear to be relevant in these examples, or whether such a theory should simply remain silent, neither confirming nor denying the distributive inferences in question.\(^\text{21}\)

The differences between (35) and (38) may cause us to reflect on the feasibility of trying to recover some context-independent notion of semantic interpretation, particularly one that does not have the potential to accommodate such nuances. The particularities of specific examples, and what may be pragmatic issues, can make it difficult to draw out generalisations from even seemingly quite trivial examples.

\(^{21}\) These perspectives are not necessarily incompatible with each other: we could formulate a weak core theory that might then be extended by additional rules that consider value judgements and other pragmatic factors (assuming that value judgements are not an essential core feature of how we reason with imperatives even at the most abstract level).
4 Survey of proposals

4.1 Overview

Broadly speaking, existing approaches to imperatives can be characterised by a number of general criteria. These include the following.

Perspective: Semantic or Pragmatic

A theory might adopt a conventional semantic approach, ascribing logical behaviour to expressions in some generic "objective" sense, independent of pragmatic concerns. Or it might model the pragmatic meaning of imperatives from the perspective of an agent, who treats commands as potentially providing a guide to plans and action. While the primary focus of these different perspectives may differ, there should be some agreement between them. For example, we might expect there to be a way of interpreting the pragmatic accounts as providing a model of the semantic behaviour.

Entailment Behaviour

Most formal accounts seek to embody some formal notion of entailment. These might include what, in principle, it would take to satisfy a command, and what commands, in principle, subsume other commands. Consideration may be given to the notion of apparently contradictory or contrary commands.

Ontology

Formal accounts may be predicated on certain ontological assumptions such as whether an imperative has underlying, or related, propositional content that characterises a desirable state of affairs that satisfies an imperative, or whether the imperative characterises an action that would satisfy it. Some even consider whether there is some more fundamental common notion that underlies both propositions and imperatives as well as the status of agents as such. Lappin (1982) argues for a generalisation of the notion of satisfaction conditions, which applies across speech-act types. The chosen ontological perspective may be used to motivate and justify a particular approach to the formal analysis. But if the primary concern is to capture patterns of behaviour, we may question whether all such distinctions are significant.

22 Examples include Hare's notions of neustic and phrastic.
Framework

Most accounts assume a particular formal framework for their analysis. This might be motivated by ontological considerations and practical questions concerning the intended nature of the analysis. Those accounts that seek to consider how an agent satisfies imperatives adopt an agent-based model that needs to decide how to fulfill the commands it has accepted. Other accounts may vary, but often assume some form of Kripkean model. In such a model, states are modelled by worlds, and actions give rise to transitions between worlds, or states. An action might then in some sense be reduced to its post-conditions.

A common approach to the formal analysis of imperatives, and other semantic problems, is to adopt a possible worlds framework (Carnap [1947], Kripke [1963]), the framework of choice since Montague’s seminal work on the formal analysis of English (e.g. Montague [1973]).

In the case of imperatives there are a number of motivations to support the use of possible worlds. Possible worlds have frequently been used to model deontic statements (this is perhaps first made explicit by von Wright 1963), which superficially at least seem to be related. Of course one difference is that judgements corresponding to deontic propositions have truthy values, while those relating to imperatives do not — at least not directly; we might however consider the truth conditions of judgements about an imperative, such as whether it was commanded or satisfied 23.

Imperatives may be considered to have a modal interpretation, in particular a deontic modal interpretation, for which possible worlds are often used (e.g. Kaufmann 2012).

Possible worlds can also be used to capture a notion of action, with accessibility relations that link worlds to the worlds that would result if the given action were performed. This may be relevant if imperatives are interpreted as specifying actions, or are considered as actions in themselves.

Issues under investigation

As with other aspects of semantics, different accounts of imperatives also approach the subject matter from different perspectives. For some the key interest is in philosophical questions about the nature of imperatives and their relationship to other notions, such as propositions. Others may be more concerned with how particular linguistic phenomena should be interpreted, and the role of pragmatics. And some will have a more formalist perspective, with an interest in determining the properties of formal systems that model imperatives. These different interests may be associated with varying degrees of rigour when it comes to the formal analysis, and coverage of linguistic data.

23 Furthermore, we might also question whether possible worlds provides an appropriate model for deontic statements (cf. Fox 2009 for example).
Parsimonious Analysis

We may prefer formal accounts of meaning that provide some uniformity in their analysis of common words and structures. For example, we might tend to favour accounts that provide a uniform interpretation of conjunction, disjunction, implication etc. that is independent of the nature of the constituents that are combined. From a methodological perspective, we may need to consider how much emphasis should be placed on providing such uniformity, particularly if it is in conflict with other desiderata. There is also the question of whether such uniformity has to be embodied by parsimonious rules and interpretations within the formal theory, or whether it is sufficient for the rules and interpretations of such words to display a “similar” behaviour at some level of abstraction. This issue arises even if we only consider propositional sentences: “and”, and “or” can be used to combine expressions of various types (the semantic correlates of sentences, nouns, noun phrases, verbs, verb phrases, adjectives, adverbs).

Summary

These categories are suggested as an informal way of characterising the different accounts. Things are not always clear cut however, and there is some overlap and inter-dependence between these different criteria. Furthermore, in some cases, the precise intended nature of a formal account may not always be immediately apparent.

As an example, it may not always be clear whether the objective of a given account is to model a notion of “validity” (entailment relations about what has been commanded) or one of “satisfaction” (entailment relations about the satisfaction conditions of commands) (Section 3.2). This may be due to lack of perspicuity. In some cases such lack of precision may muddy the water when it comes to evaluating the intuitions that inform that formal analysis. In other cases, an account may fail to address a concern that appears crucial for those approaching the subject matter from a different perspective.

Below we give examples of semantic accounts that use a modal approach, action-based accounts, dynamic accounts with to-do lists, and resource sensitive formalisations. As with the problematic cases (Section 3) it is sometimes appropriate to consider insights from the study of deontic expressions when reflecting on the analysis of imperatives.

A Note on Terminology

It is worth noting that there is no consistent terminology for naming the distinct approaches. Some consider “to do lists” (e.g. Portner 2005) as property-based approaches (e.g. Starr 2012) (as the imperatives are represented by properties Hauser 1978 Portner 2005 2007 2010), but others may consider them to be a variety of “dynamic” approach, as they deal with the pragmatics of what happens when an imperative is uttered, or accepted (Charlow).
The term “dynamic” could also be applied to a semantic analysis that treats imperatives as specifying required actions as opposed to required outcomes (e.g. Pérez-Ramírez & Fox, 2003). Theories that are more preoccupied by semantic rather than pragmatic issues may be termed “static” (Charlow 2011), but they have also been referred to as modal Starr (e.g. 2012), as they are typically formulated in terms of possible worlds style modalities. However dynamic accounts (of both flavours) have also been formulated within possible worlds frameworks.

4.2 Lewis’s Modal Account

Lewis (1979) models a master-slave relationship. For the slave, there are accessible worlds that capture possible states of how the world might be — the worlds that the slave might bring about through action. Commands are associated with propositions. When the master issues a command this is interpreted as constraining those worlds that might be brought about by the slave to those in which the associated proposition holds. Imperatives thus guide the actions of the slave.

This account relates the meaning of imperatives to modal notions, and underlying propositional content. The modal framework provides an interpretation of connectives between imperatives. If the accessibility relationship is interpreted as modelling actions, the account provides a link between proposition content and actions. Furthermore, if we consider how the possibilities for the slave change as commands are imposed, the approach can also be construed as a “dynamic” account of discourse.

There are some drawbacks to the account. For example, it does not allow us to entertain contradictory or contrary commands, nor does it overtly consider various ways in imperatives may be combined with propositions.

4.3 Modal Subordination

There are other accounts that relate imperatives to modals. For example, Kaufmann & Schwager (2011) adopt Kratzer (1981)’s analysis of modal subordination (see Chapter 8, “Conditionals and Modality”). Essentially, the modal subordination account seeks to (i) incorporate some context-sensitivity in the interpretation of modals, and (ii) capture different modal notions by distinct “rankings” of those worlds. The term modal base is used to refer to worlds that are under consideration, and the term ordering source is used to refer to rankings of the possibilities given by the modal base with regard to their “relevance”, “plausibility” or “desirability” etc. Different ordering sources reflect different modal notions, such as desires, and ethical and legal obligations, for example.

The ordering source can be used to provide a model of imperatives; those worlds that satisfy an imperative (or a collection of imperatives) will be ranked higher than those that do not. For imperatives at least, we might
take the modal base to characterise the “conversational background” of what is known to be the case. If an agent’s goal is to satisfy imperatives, then the agent should take actions that leads to a world that is highly ranked according to the relevant ordering, against a background of what is known.

In principle, this allows contradictory imperatives to be modelled, e.g. by using a (partial) ordering for the ranking. Not all commands need be satisfied in the most desirable world(s). It might also provide the machinery for an account of “instructional” uses of imperatives, where the imperatives provide an ordering for a modal base that captures the context in which the instructions are intended to be applied, including modal antecedents (Kratzer 1981).

(42) “If you want to get to Harlem, then take the A train.”

If one accepts the view that possible worlds provide the most appropriate account of the modal antecedent, then it may be parsimonious to try to model the imperative consequences in terms of possible worlds. It has however been questioned whether existing possible worlds accounts of modal subordination capture the appropriate behaviour in all cases (Zvolenszky 2002).

4.4 Imperatives and Actions

Imperatives can be thought of as characterising a desirable action, either “directly”, in some sense, or by way of the post conditions of the desired action. The post-conditions of an action are those things that are true as a result of performing that action.

This is related to accounts of the semantics of programming languages — or the specification of computer programs — as with Hoare Logic (Hoare 1978) or some variant (e.g. Pratt 1976). In this setting we can talk about when an action is applicable (its “weakest pre-conditions”) and those things that necessarily follow from the action (its “strongest post-conditions”). We can also formulate operations that apply directly to actions, and then model their “meaning” by considering how the postconditions of the constituent actions are to be combined.

Such operations might include sequencing, choice, and conditionals. We can then consider modelling imperatives either in terms of the desired post-conditions, or in terms of actions.

Negation is something that does not typically arise in a programming context, so expressing the intent of (43) requires some thought: it seems wrong to say that the imperative is satisfied by an action that is a “not-biting-the-apple” action.

(43) “Don’t bite the apple!”

This is not a demand to engage in an action, or produce a particular outcome. Rather, it is a demand to refrain from an action, and avoid a particular
outcome.\footnote{Other issues arise here, such as whether we are concerned with passively avoiding an outcome as opposed to actively preventing it. But here will concentrate on the basic case as exemplified by \cite{43}.} One approach is to say that the imperative is satisfied if (in the salient context), the action does not take place, or the outcome does not arise.

A comprehensive analysis along these lines would have to pay attention to the issues such as concurrency and non-determinism. Typically there may be side-effects of some operations. These can be challenging to capture, and present a fundamental problem in the field of Artificial Intelligence \cite{25}.

Possible worlds accounts may tacitly assume that the accessibility relation between worlds characterises the actions available to an agent. It is appropriate to consider whether this can be made more systematic, with suitable constraints on how actions should be characterised individually and when combined.

Some examples where actions feature overtly in a possible worlds analysis of imperatives include \cite{25}, and \cite{25}. \cite{25} essentially build on the work of \cite{25}, but are concerned with blocking disjunction introduction (among other things), which they consider to be problematic according to their interpretation of Ross’s Paradox (Section 3.2).\footnote{In part this is achieved by adopting a very weak logic; one that does not support other patterns of entailment that might be desirable.}

4.5 Dynamic–Pragmatic Accounts

Instead of considering the satisfaction of imperatives, we can instead study the performative aspects of their meaning. This involves considering the dynamic impact that imperatives have on the participants in a discourse. For example, in \cite{25}’s account we might consider the change that is brought about in the slaves perception of possibilities on receiving a new command. Examples of such an approach include those of \cite{25}, and the to-do lists of \cite{25}.

Independent of any agent-centric perspective, as exemplified by “to-do” lists, the imperatives themselves still require some kind of representation, and interpretation. One representation is that of a property \cite{25}. We may then consider the meaning of various relationships between such representations, and whether they might be interpreted as providing some form of logic of imperatives. A candidate for consideration is that of “containment”; when one property is (extensionally) contained within another. Thus if $R(x)$ implies $Q(x)$, we might say that in some sense $R$ entails $Q$. If $R$, $Q$ are intended to be interpreted as imperatives, we can consider how the relationship behaves in the context of more complex imperatives. We can also consider our intuitions about what such an entailment relation might mean.
When presented with a new imperative, an agent may either ignore it or adopt it, in effect consenting to comply with it. To be able to do so, an agent needs to be able to assess whether an imperative is consistent with existing imperatives that have been adopted, and revise how and whether other previously adopted imperatives are to be complied with in light of the new imperative.

Methodologically there are two perspectives that might be adopted here. One is that the reasoning of an agent has to be informed by some independent characterisation of the logical behaviour of imperatives, including free-choice and conditional imperatives. The other is that the agent’s treatment of imperatives in forming plans defines, or at least informs, the formal properties and entailments of imperatives.

Some pragmatic accounts seek to consider the non-command interpretation of imperatives. This may be achieved either by maintaining that there is a single core meaning that has different import in different contexts (see Huntley, 1984; Portner, 2007; 2010; Kaufmann, 2012; Hare, 1952 for example), or by arguing that there is some accommodation effect that renders an indirect speech act more salient (without completely cancelling the primary meaning) (Charlow, 2011). Charlow (2011) and others also argue that imperatives bring an issue to attention. Even “logically” vacuous imperatives (both commanding and permissive) add information by making an agent “aware” of an issue, or choice. This is akin to the notion of a Question under Discussion (Chapter 25, “Semantics and Dialogue”) (cf. Ginzburg & Sag, 2000).

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26 This update process can be thought of as similar in kind to “belief revision”.
27 Charlow, for example, argues that this is required in order to account for certain interpretations of strong permission. Whether an imperative is interpreted as defeasible is also a matter of context, and general reasoning.
28 In the possible worlds framework, this might be modelled through some form of partitioning of the space of possibilities. Awareness of an issue/question is then modelled by the existence of an appropriate partition (cf. Groenendijk & Stokhof, 1984).
5 A Judgmental Approach

Here we present a non-reductive analysis which seeks to clarify what kind of intuitions are being captured by the entailment rules. This account is essentially a version of the theory presented in Fox (2012). It aims to illustrate how we can formulate rules about judgements concerning imperatives without being required to consider the “truth” of imperatives (and without resorting to some set-theoretic interpretation). It is not intended to be a complete formalisation. In particular, it restricts itself to a quasi-propositional analysis, without quantifiers, properties or relations. Aspects of the relationship between (judgements about) imperatives and propositions are also left unanalysed.

5.1 In defense of a non-reductive analysis

Much contemporary work in formal semantics uses, or presupposes, a possible worlds analysis. One potential problem in jumping directly to such interpretations is that it imposes an ontological reduction. Everything is just a set. This may unintentionally lead to the conflation of distinct notions, and unintended side-effects due to contingent properties of the chosen model (Fox & Turner, 2012).

Regardless of the chosen framework, conceptual intuitions about the data are being captured, even if those are implicit in the narrative, rather than being explicit in the formalisation. A case can be made that what is required here is a clear formalisation of the intuitive behaviour of imperatives — and actions, if appropriate — independent of any particular model. Without that “gold-standard” it can be hard to evaluate whether a particular interpretation in a given model is appropriate, as the relationship to our intuitions might be inperspicuous.

In this presentation, we give just a selection of rules for imperatives. An alternative presentation, with discussion, can be found in Fox (2012).

5.2 Nature of judgements

We proceed by observing that rules of inference for classical logic are actually rules concerning judgements. When we write a rule of inference such as 

\[ \frac{a \land b}{a} \]

we are really saying that if \( a \) is true and \( b \) is true, then \( a \land b \) is also true.

By “non-reductive” we mean that we aim to capture patterns of behaviour directly in the form of proof rules, rather than finding, or defining, a mapping from imperatives into some set-theoretic interpretation.

In that account, there are additional illustrations of how the analysis addresses some of the problematic cases given above.
We can make this explicit, as in (45).

\[(45) \quad a \text{ True} \quad b \text{ True} \quad \frac{(a \land b) \text{ True}}{}\]

Furthermore, \(a, b\) and \((a \land b)\) are assumed to be propositions. We can also make this explicit, as in (46).

\[(46) \quad a \text{ Prop} \quad b \text{ Prop} \quad (a \land b) \text{ Prop} \quad a \text{ True} \quad b \text{ True} \quad \frac{(a \land b) \text{ True}}{}\]

It seems appropriate to infer \((a \land b) \text{ Prop}\) directly from \(a, b \text{ Prop}\), as with (47a), simplifying the rules for truth (47b).

\[(47) \quad (a) \quad a \text{ Prop} \quad b \text{ Prop} \quad (a \land b) \text{ Prop} \quad a \text{ True} \quad b \text{ True} \quad \frac{(a \land b) \text{ True}}{}\]

If there is only one kind of judgement, as in conventional presentations of classical logic (that of \textit{being true}), then it is redundant to make this explicit. Similarly if there is only one kind of semantic object (a proposition), then it would be redundant to make explicit the “side condition” that both \(a\) and \(b\) are propositions. In most presentations of formal logic, some independent rules of syntax will tell us that \(a \land b\) is a proposition if \(a\) and \(b\) are propositions.

Here we wish to introduce other kinds of judgements, such as being an imperative, and being satisfied. So it is appropriate to make the relevant judgements explicit. Even so, if the theory is set up in a way that allows us to prove that only propositions have their truth conditions considered, then the typing assumptions \(a \text{ Prop}\) and \(b \text{ Prop}\) in (47b) could be dropped.

We can go one step further, and introduce a notion of a context \(\Gamma\) in which \(a \text{ Prop}\) or \(a \text{ True}\), illustrated in (48).

\[(48) \quad (a) \quad \frac{\Gamma \vdash a \text{ Prop}}{\Gamma \vdash (a \land b) \text{ Prop}} \quad \frac{\Gamma \vdash b \text{ Prop}}{} \quad (b) \quad \frac{\Gamma \vdash a \text{ Prop}}{\Gamma \vdash (a \land b) \text{ True}} \quad \frac{\Gamma \vdash b \text{ Prop}}{} \quad \frac{\Gamma \vdash a \text{ True}}{} \quad \frac{\Gamma \vdash b \text{ True}}{} \quad \frac{\Gamma \vdash (a \land b) \text{ True}}{}\]

The use of such sequents simplifies the presentation of rules involving (discharged) assumptions. In the case of implication introduction (49a), for example, the context \(\Gamma, a\) can be used to represent the assumption that the antecedent \(a\) is true. If the consequent \(b\) is true with that assumption, then we can infer that \(a \rightarrow b\) is true in the original (possibly empty) context \(\Gamma\).

\[(49) \quad (a) \quad \frac{\Gamma \vdash a \text{ Prop}}{\frac{\Gamma \vdash b \text{ Prop}}{\Gamma \vdash (a \rightarrow b) \text{ Prop}}} \quad \frac{\Gamma \vdash a \text{ True}}{} \quad \frac{\Gamma \vdash b \text{ True}}{} \quad \frac{\Gamma \vdash (a \rightarrow b) \text{ True}}{} \quad \frac{\Gamma, a \vdash b \text{ True}}{\Gamma \vdash (a \rightarrow b) \text{ True}} \quad \frac{\Gamma \vdash a \text{ True}}{} \quad \frac{\Gamma \vdash a \text{ True}}{\Gamma \vdash b \text{ True}}\]
The presence of “a True” in the context for the main premise corresponds
to the assumption of the truth of a. Its absence in the context for the conclu-
sion corresponds to the “discharging” of that assumption.

If our notion of proposition is completely independent of the notion of
truth, then it might appear strange to incorporate these judgements within the
inference rules. But if we wish to make different judgements about different
kinds of expressions (such as judgements of satisfaction for imperatives), then
it seems appropriate to include the behaviour of these categorical judgements
within a uniform framework.

In effect, what we have described here is fragment of propositional logic formu-
lated in a style similar to Turner (2009)’s Typed Predicate Logic (TPL). We
can also give the rules for disjunction (50), as well as propositional
inconsistency (Ω) and classical negation (51).

\[(50)\]
\[
\frac{\Gamma \vdash a \text{ Prop} \quad \Gamma \vdash b \text{ Prop}}{\Gamma \vdash a \vee b \text{ Prop}}
\]
\[
\frac{\Gamma \vdash \text{True} \quad \Gamma \vdash b \text{ Prop}}{\Gamma \vdash a \vee b \text{ True}}
\]
\[
\frac{\Gamma \vdash a \text{ Prop} \quad \Gamma \vdash \text{True}}{\Gamma \vdash a \vee \text{True}}
\]
\[
\frac{\Gamma, a \text{ True} \vdash c \text{ True} \quad \Gamma, b \text{ True} \vdash c \text{ True} \quad \Gamma \vdash a \vee b \text{ True}}{\Gamma \vdash c \text{ True}}
\]

\[(51)\]
\[
\frac{\Gamma \vdash \text{Prop}}{\Gamma \vdash \bot}
\]
\[
\frac{\Gamma \vdash p \text{ Prop}}{\Gamma \vdash p \text{ True}}
\]
\[
\frac{\neg a \equiv \text{def} a \rightarrow \Omega}{\Gamma \vdash \neg a \vdash \Omega \text{ True}}
\]
\[
\frac{\Gamma \vdash \neg a \vdash \Omega \text{ True}}{\Gamma \vdash a \text{ True}}
\]

A full formalisation of predicate logic should also include appropriate struc-
tural rules such as assumption and thinning, as in (52).

---

31 Note that they need not be independent. We can consider weak impliciation where
we can only show \((a \rightarrow b)\) is a proposition in the context in which \(a\) is true.
32 The logic presented can be thought of as the propositional fragment of the base
logic \(C_0\) of Turner (2005). Because there are no variables or quantifiers, we do
not need to rely on the more general analysis of types that is supported by TPL.
Turner (2005) builds a stratified intensional logic — within TPL — on top of the
base logic \(C_0\). An alternative approach is taken by Fox & Lappin (2014), which
gives a reformulation of Property Theory with Curry Typing (PTCT, cf. Chapter
11, Section 3) in TPL.
33 An intuitionistic theory results if we remove the last of these rules (51d).
(52) (a) \[ \Gamma \vdash p \text{ Prop} \]
\[ \Gamma, p \text{ True} \vdash p \text{ True} \]

(b) \[ \Gamma \vdash p \text{ True} \Gamma \vdash q \text{ Prop} \]
\[ \Gamma, q \text{ True} \vdash p \text{ True} \]

In cases where the context is fixed, the notation “\( \Gamma \vdash \)” may be omitted. Similarly, the propositional truth judgement may be omitted, so “\( \Gamma \vdash a \text{ True} \)” might be written as just “\( a \)”.
Assuming appropriate rules for syntax, type constraints on the terms in the assumptions of a proof rule can be derived rather than stated. As an example, using these abbreviations and eliminating redundant assumptions, the *modus ponens* rule of (49c) can be simplified to the more familiar form given in (53).

(53) \[ a \rightarrow b \quad a \]
\[ b \]

The important point is that this rule is now explicitly an abbreviation for particular kinds of judgement (that of truth), for terms that are of an appropriate type.

5.3 A framework for judgements

We build on the logic of the previous section, and introduce a type-judgement that syntactically characterises quasi-propositional imperatives, and judgements corresponding to the satisfaction of an imperative (Fox, 2012).

Arguably, in such an account there is a sense in which the notions of proposition and truth are somehow more basic than those of “being an imperative”, and “being satisfied”.

Here we give a slightly different presentation, where imperatives, propositions, truth and satisfaction are treated on a par, at least within the notation.

Basic Judgements

In the atomic judgements of the theory, (54) illustrates the parallels between propositions and imperatives.

(54) Judgements for propositions and imperatives

<table>
<thead>
<tr>
<th>Propositions</th>
<th>Imperatives</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Syntax” ( p \text{ Prop} )</td>
<td>( i \text{ Imp} )</td>
</tr>
<tr>
<td>“Semantics” ( p \text{ True} )</td>
<td>( i \text{ Satisfied}_i )</td>
</tr>
<tr>
<td>“Semantics” ( p \text{ False} )</td>
<td>( i \text{ unSatisfied}_i )</td>
</tr>
</tbody>
</table>

Here we are assuming that \( i \text{ Satisfied}_i \) (\( i \text{ unSatisfied}_i \)) are judgements on a par with other judgements in TPL, such as proposition, truth, and type-membership. An alternative approach it to consider \( \text{Satisfied} \) (\( \text{unSatisfied} \)) to be a predicate that holds of imperatives when they are satisfied (unsatisfied).
5.4 Satisfaction

We use a $\text{Satisfied}_\sigma$ and a $\text{unSatisfied}_\sigma$ to express the judgements — or meta-level predicates — that imperative $a$ has been satisfied, or not, by subject $\sigma$.

It is inconsistent to assert that the same imperative had both been satisfied and not satisfied.

\[(55) \quad \frac{a \text{Satisfied}_\sigma \quad a \text{unSatisfied}_\sigma}{\bot}\]

Note that in the presentation of the rules given here, we elide the contextual judgement, and write $a$ in place of $\Gamma \vdash a$, and we omit the categorial judgement that $a$ is an imperative.

In order to provide a complete analysis, the meaning of $\bot$ in $[55]$ needs to be formalised. If we interpret $\text{Satisfied}$ and $\text{unSatisfied}$ as predicates, then it is natural to interpret $\bot$ as the propositional inconsistency $\Omega$, as characterised by $[51]$.

If $\text{a Satisfied}_\sigma$ and $\text{a unSatisfied}_\sigma$ are primitive judgements, then we would need to further elaborate the relationship between judgements about imperatives and judgements about propositions in such cases.

While $\text{a Satisfied}_\sigma$ and $\text{a unSatisfied}_\sigma$ are contrary, they need not be contradictory (so on the propositional interpretation, $\text{unSatisfied}(a)$ does not correspond to $\neg \text{Satisfied}(a)$). As a consequence, it is sometimes necessary to formulate rules for both the positive and negative cases explicitly, as in $[56]$.

Just as we can consider the truth conditions of a proposition without claiming the proposition is a fact, or has been asserted, we can also consider the satisfaction conditions of imperatives without claiming the imperative has indeed been commanded.

Conjunction

Conjunction is subject to the expected rules for satisfaction. Both conjuncts must be satisfied for their conjunction to be satisfied. The conjunction is judged to be unsatisfied if either conjunct is not satisfied.

\[(56) \quad \text{Conjunction}\]

\[
\begin{align*}
(a \land b) & \vdash a \text{Imp} \quad b \text{Imp} \\
& \quad \frac{}{(a \land b) \text{Imp}} \\
& \quad \frac{a \text{Satisfied}_\sigma \quad b \text{Satisfied}_\sigma}{(a \land b) \text{Satisfied}_\sigma} \\
& \quad \frac{a \text{unSatisfied}_\sigma \quad b \text{unSatisfied}_\sigma}{(a \land b) \text{unSatisfied}_\sigma} \\
& \quad \frac{(a \land b) \text{unSatisfied}_\sigma}{(a \land b) \text{unSatisfied}_\sigma}
\end{align*}
\]

\[34\] Alternatively, if we wished to equate $\text{unSatisfied}(a)$ with $\neg \text{Satisfied}(a)$ we would need to consider allowing truth-value gaps in the basic propositional logic.
10. The Semantics of Imperatives

Sequential “and then” conjunction is considered in Section 5.6.

Free Choice

The core behaviour of free-choice disjunction is given by the rules in (57), where the disjunction is satisfied if either one of the disjunctions is satisfied (and the other is not), and is not satisfied if both are not satisfied.

\[(57)\quad \text{Basic Free Choice}\]
\[
\begin{align*}
(a \lor FC b) & \implies Imp \\
& \frac{(a \land b) \text{ Satisfied}_\sigma}{a \text{ Satisfied}_\sigma} \quad \frac{(a \land b) \text{ Satisfied}_\sigma}{b \text{ Satisfied}_\sigma} \\
& \frac{(a \lor FC b) \text{ unSatisfied}_\sigma}{a \text{ unSatisfied}_\sigma} \quad \frac{(a \lor FC b) \text{ unSatisfied}_\sigma}{b \text{ unSatisfied}_\sigma} \\
\end{align*}
\]

We can strengthen this core behaviour by adopting an exclusive interpretation of free-choice, where satisfying both disjuncts leads to an explicit failure to satisfy the free-choice imperative. This captures the intuition that both going to the beach and playing in the park would not satisfy the exclusive interpretation of (12) “Go to the beach or play in the park!”. Alternatively, we could add rules for an inclusive interpretation (see Fox, 2012).

Negation

The judgements of \(a \text{ Satisfied}_\sigma\) and \(a \text{ unSatisfied}_\sigma\) are exclusive.

\[(58)\quad \text{Negation}\]
\[
\begin{align*}
& \frac{a \implies \neg a}{\neg a \implies \neg \neg a} \\
\end{align*}
\]
With these rules, the judgements of being satisfied or unsatisfied are not exhaustive — a may be neither satisfied or unsatisfied. This potential “limbo” may be appropriate if an imperative is not yet satisfied, but is still potentially satisfiable.

Note that (55) already rules out the possibility that an imperative is both satisfied and unsatisfied.

Conditionals

Initially we give a very weak analysis of conditional imperatives. As conditionals have propositional content, the rules that govern them involve judgements of truth, in addition to satisfaction.

\[(59) \textit{Conditionals} \]
\[
\frac{p \text{ Prop} \quad a \text{ Imp}}{(p \rightarrow a) \text{ Imp}}
\]
\[
\frac{p \text{ True} \quad a \text{ Satisfied}_\sigma}{(p \rightarrow a) \text{ Satisfied}_\sigma}
\]
\[
\frac{p \text{ True} \quad a \text{ unSatisfied}_\sigma}{(p \rightarrow a) \text{ unSatisfied}_\sigma}
\]
\[
\frac{a \text{ Satisfied}_\sigma}{(p \rightarrow a) \text{ Satisfied}_\sigma}
\]
\[
\frac{a \text{ unSatisfied}_\sigma}{(p \rightarrow a) \text{ unSatisfied}_\sigma}
\]

We could strengthen this to allow an inference that the conditional is satisfied when the antecedent is false (2.5) (see Fox, 2012).

Pseudo-Or

Disjunctive pseudo-imperatives have the same satisfaction criteria as their imperative constituent.

\[(60) \textit{Pseudo-Or} \]
\[
\frac{a \text{ Imp} \quad p \text{ Prop}}{(a \lor p) \text{ Imp}}
\]
\[
\frac{a \text{ Satisfied}_\sigma}{(a \lor p) \text{ Satisfied}_\sigma}
\]
\[
\frac{a \text{ unSatisfied}_\sigma}{(a \lor p) \text{ unSatisfied}_\sigma}
\]
\[
\frac{(a \lor p) \text{ Satisfied}_\sigma}{a \text{ Satisfied}_\sigma}
\]
\[
\frac{(a \lor p) \text{ unSatisfied}_\sigma}{a \text{ unSatisfied}_\sigma}
\]
5.5 Truth

Finally we can consider the judgements of truth. Such judgements are required for the analysis of pseudo-imperatives and conditional imperatives.

(61) Standard Connectives: As for classical logic (as exemplified in Section 5.2).

(62) Pseudo-And

\[
\begin{align*}
\frac{a \text{ Imp } p \text{ Prop}}{a \land p \text{ Prop}} \\
(\alpha) & \quad \frac{(a \land p) \text{ True } \quad a \text{ Satisfied}_{\sigma}}{p \text{ True}} \\
(\beta) & \quad \frac{a \text{ Satisfied}_{\sigma} \quad p \text{ True}}{(a \land p) \text{ True}} \\
(\gamma) & \quad \frac{(a \land p) \text{ True } \quad (a \land p) \text{ False}}{p \text{ False}} \\
\end{align*}
\]

(63) Pseudo-Or

\[
\begin{align*}
\frac{a \text{ Imp } p \text{ Prop}}{a \lor p \text{ Prop}} \\
(\alpha) & \quad \frac{(a \lor p) \text{ True } \quad a \text{ unSatisfied}_{\sigma}}{p \text{ True}} \\
(\beta) & \quad \frac{p \text{ True}}{(a \lor p) \text{ True}} \\
(\gamma) & \quad \frac{(a \lor p) \text{ True } \quad (a \lor p) \text{ True}}{a \text{ Satisfied}_{\sigma}} \\
\end{align*}
\]

5.6 Sequential Commands

Sequential commands (Segerberg, 1990) were alluded to in Section 2.3. A formulation of the behaviour of imperatives of the form “Do a and then do b!” is given in (64).

(64) \[
\begin{align*}
\frac{a \land b \text{ Imp}}{a \land T b \text{ Imp}} \\
(\alpha) & \quad \frac{(a \land T b) \text{ Commanded}_{\alpha} \quad \neg a \text{ Commanded}_{\alpha}}{\alpha \text{ Incoherent}} \\
(\beta) & \quad \frac{(a \land T b) \text{ Commanded}_{\alpha} \quad b \text{ Commanded}_{\alpha}}{\alpha \text{ Incoherent}} \\
(\gamma) & \quad \frac{a \text{ Satisfied}_{\sigma} \quad (a \land T b) \text{ Commanded}_{\alpha} \quad b \text{ Commanded}_{\alpha}}{\alpha \text{ Incoherent}} \\
\end{align*}
\]

\textit{Classical interpretations of conditional and disjunctive propositions are given here, although they do not necessarily provide the most appropriate foundation for the analysis of phenomena such as counter-factu-als and free-choice disjunction.
5.7 A comment on the formalisation

The objective here is not to give a comprehensive analysis of all patterns of behaviour, or capture all the various contextual, pragmatic, and linguistic factors that constrain the salient interpretations and rules of entailment. Rather, the aim is to show how we can use the notion of an explicit judgement to present a formal analysis that avoids confusion about what kinds of judgements are at stake, and allows us to consider semantic insights, and the impact of various factors in the interpretation, independent of any particular reductive analysis.

Other rules can be formulated, and various contextual effects might be modelled to constrain which rules are applicable. We can extend the analysis to include consideration of the question of whether a collection of imperatives is coherent or not, as determined by whether it is logically possible for all the imperatives to be satisfied simultaneously, without contradiction (Fox 2012).

Furthermore, we can model the idea that some form of transgression arises in the event that something has been commanded that has not been satisfied (Anderson 1958; Fox 2009; Wyner 2008). Such a transgression can be specific to the imperatives in question, thus avoiding some of the problems of a generic transgression.

One key area that is left unformalised here is the relationship between an imperative being (un)satisfied and some propositional correlate (and its logical consequences) being true (or false). If “Close the door!” is satisfied, then at some point that means the door is closed. One approach that could be adopted formalise something akin to Hare’s (1952) notions of neustic and phrastic. In relation to this, to the language of imperatives (and propositions) presented here would need to be generalised beyond the (quasi) propositional level to include quantification, properties and relations.

The same framework could be used to deal with other semantic and pragmatic phenomenon, including the interpretation and logical behaviours of speech acts, and satisfaction acts. What is given is essentially an abstract characterisation of just one aspect of the formal interpretation of imperatives.
5.8 Models for Imperative Theories

Here we give no model of the proposed rules. On the account being advocated here, the notion of a model provides one means of checking that any proposed system of rules has a consistent interpretation. It does not necessarily play any role in capturing the intended interpretation of the formalism, or in understanding the subject matter of the theory. Clearly once a comprehensive analysis is formulated, or extensions are proposed, it is appropriate to ensure that the final system is coherent. Constructing a model is one way in which this can be achieved.

In the case of the framework proposed here, one approach would be to model the propositions $P$ and imperatives $I$, and the operators that can combine them, as classes of terms. Closure rules would then need to be given to reflect the syntax of $P$ and $I$ (so that, for example, the representation of a conjunction of imperatives was also in the class representing imperatives). Further classes and closure rules could then be added to model the judgements.

If appropriately constructed, the interpretation and the closure rules would demonstrate that there is a consistent interpretation of the proposed collection of inference rules. In effect this would be a generalisation of a set-theoretic model for propositional logic.

5.9 Summary

The formalisation sketched above addresses a number of concerns about the logic of imperatives. By making it explicit that the entailments are generally concerned with judgements about expressions rather than just truth within a logic, we deal with Jørgensen’s dilemma (Section 3.1). By also making explicit exactly which judgements are in question, we avoid Ross’s Paradox (Section 3.2). Within such a framework of judgements, we can give an account of conditional imperatives of the form of the Good Samaritan examples (Section 3.3). We can also allow expressions to have both propositional and imperatives interpretations, as with the pseudo-imperatives (Section 2.6), with truth conditions and satisfaction conditions.

Some things that are not taken up include instructional uses of imperatives (cf. (38) in Section 3.3), and the value judgements that appear to be required to distinguish threats from promises (Section 2.6). Instead, we have captured something like Huntley (1984)’s notion of a core meaning for imperatives (Section 1).

Clearly more work is required to include pragmatic effects. The hope is that these can be expressed in a general way that can build on these core interpretations, within the same language of judgements.
6 Conclusions

We have touched on some of the issues that have to be considered by a semantic theory of imperatives, as well as some questions concerning the pragmatics of imperatives. While not intending to offer a definitive account, this chapter advocates the consideration of a methodology for formulating intuitions about imperatives.

The formalisation offered is not intended to capture the rules that govern imperatives, but instead it suggests how we might go about formalising our intuitions in a way that allows us to reflect more carefully on whether they are coherent, and can be given a consistent interpretation. It also enables us to identify where they make problematic predictions. This then provides grounds for amending or enriching the ontological notions required.

Adopting this axiomatic (proof-theoretic) approach may also help us to see whether formal problems are due to shortcomings in the analysis, as opposed to artifacts of a reduction to some model, such as possible worlds.
References


Fox, Chris (2010), The good Samaritan and the hygienic cook, in Piotr Stalmaszczyk (ed.), *Philosophy of Language and Linguistics*, Ontos Verlag, volume I: The Formal Turn of Linguistics and Philosophy.


Fox, Chris & Raymond Turner (2012), In defense of axiomatic semantics, in Piotr Stalmaszczyk (ed.), *Philosophical and Formal Approaches to Linguistic Analysis*, Ontos Verlag, (145–160).


Hausser, Roland (1978), Surface compositionality and the semantics of mood, in Jeroen Groenendijk & Martin Stokhof (eds.), *Amsterdam Papers in Formal Grammar*, University of Amsterdam, volume II, same as Hauser 1980. Advocated imperatives as properties of agents (according to Portner 2005).


Montague, Richard (1973), The proper treatment of quantification in ordinary English, in K. J. J. Hintikka, J. M. E. Moravcsik, & P. Suppes (eds.), *Approaches


Ross, Alf (1941). Imperatives and logic, Theoria 7:53–71, republished as Ross (1945).

Ross, Alf (1945). Imperatives and logic, Philosophy of Science 11:30–46.


