I. Introduction

Aristotle said that our human capacity to reason is one of the definitive features of being a member of the human race. Indeed, his definition of a human being was "Rational animal". This being the case, we should celebrate our rational faculties.

One of the contexts in which our rationality plays a key role is when we make judgments. Descartes (in his 4th Meditation for instance), offers an account of error that is based upon our making judgments, without sufficiently ensuring that judgments are in accordance with reason. Thus, if we are to make good judgments, then we are going to need good reasoning skills.

Unfortunately, good reasoning is a skill. Whilst (almost) everyone has some rational capacities, not everyone is a good reasoner. Consider an analogy. Most people, who do not have specific functional deficits, have some capacity to run. This does not imply that everyone can run well. For instance, a person who takes little exercise will not be able to run as well as someone who has trained for the Olympic team. The situation is similar with reasoning. A person who has been trained to reason well, will be able to make much better judgments than a person who has no training.

These facts though do not stop people from making attempts at reasoning and make judgments all the time. However, it is quite often the case that the reasoning is at times defective. Indeed, it is one of the great ironies that occasionally folks who pontificate about judgment and reasoning are most often guilty of the most elementary logical mistakes.

So, in order to try and raise the general quality of judgment, a few basic technical concepts about reasoning will be introduced here. Philosophers are almost unique amongst academics in so much as we have several thousand years of serious study of logic and reasoning. In other words, we have explicit training in good reasoning, that others may not have. By introducing an explicit discussion of reasoning, it is hoped that the quality of judgments will be enhanced. This is a fundamentally 'philosophical' project. This is because the Greek roots of the term 'philosophy' means "Love of Wisdom". One of the great enemies of wisdom is stupidity. Poor reasoning often leads people to stupid conclusions. Thus, one step towards wisdom is to be able to avoid poor reasoning. Hopefully, the discussion offered here will help in this respect.

II. Beliefs and Arguments

Our beliefs are crucially important to us. They quite literally determine who we are! To cite some simple examples, people have beliefs about their names, their personal histories, their likes and dislikes, the people they know and a host of other topics.

Some beliefs are more important than others. For example, should a person learn that certain beliefs about their parents are incorrect, this can be devastating. By contrast, being mistaken about the name of the good pizza place is much less traumatic.
Interesting questions arise though when it comes to determining what to believe. Ideally, our beliefs should not be random. Instead, we should have good reasons for the beliefs we hold. Consider the case of your belief about your name. You probably hold this belief on the basis of the language used by your friends and relations, when they address you. You can also check places like your birth certificate, driving license and passport, should any doubts arise. Not all beliefs can be checked out as easily.

If we accept the idea that we should have 'good reasons' for the beliefs we hold, then the question becomes 'What is a good reason?' Traditionally, the best kinds of reasons come from arguments. Now, it is important to realize that this use of the term 'argument' is a little different from the vernacular use of the word. In normal use, an 'argument' often involves two people disagreeing over a particular topic. Sometimes this kind of argument can get heated, a bit nasty and in extreme cases may even involve people throwing things. However, this is not the sense in which the term 'argument' is used here. In the current context, the term 'argument' means,

An argument is a set of propositions, the premises, which are offered in support of some further proposition, the conclusion.

This is one of those cases where philosophers have given a normal word a rather special meaning and then forgot to mention this fact to others. Understanding an argument in this sense, though, is the first step in getting a handle on better reasoning. Holding beliefs that are supported by strong arguments can lead to our making much more rational judgments and (hopefully) living better lives.

Even when one already has a firmly established set of beliefs on a topic, it can be useful to assess the arguments that can be given to support those beliefs. This is the case because there may be mistakes in arguments for important beliefs that one has overlooked. It is also the case that the rationality of certain beliefs may change over time, due to new information, or changing circumstance. The case of one's belief about what the name of today is, provides a fairly trivial example of why beliefs should be checked from time to time – tomorrow the name of the day will be different. Similarly, a person's belief that they wish to pursue a career in medicine may be changed when they discover the new fact that they cannot stand the sight of blood.

Another reason that the arguments used to support beliefs should be examined more closely, is because from time to time inconsistencies in one's beliefs may appear and need to be resolved. To cite a common example, most people believe that they should not do things which are unhealthy to them. Most people also believe that smoking is unhealthy. Yet, as there are still people who smoke, it would seem likely that these individuals will have inconsistencies in their belief sets.

Beliefs and their relationships to arguments, understood in a slightly technical sense, have been introduced. The next thing that needs to be looked at will be different types of arguments.

III. Types of Arguments

Language is one of mankind's greatest inventions. We can use language to make statements, issue commands, ask questions, offer explanations, make jokes and do a host of other things. Making arguments is only one, relatively specialized use of language, albeit a rather important one.

It is useful to be aware that there are various kinds of arguments. The different kinds of arguments each have their own special kinds of uses, strengths and weaknesses. They also need to be handled rather differently from one another. However, before looking at the kinds of arguments, a few brief words
about explanations are in order.

Explanations are very similar to arguments and can easily be confused with them. The basic difference between arguments and explanations is that arguments are offered to attempt to make someone believe that something is the case, namely the conclusion. By contrast, explanations presume what they are explaining and instead provide reasons why or how it is the case. There are roughly three main kinds of explanations.

1) **Explanations by purpose** fit phenomena into a recognizable pattern, or a human purpose. For example, we may explain why we read a certain kind of literature, by noting a particular interest in a topic covered in that literature. Similarly, another person might use this kind of explanation to explain why they read Internet blogs by appealing to their abiding interest in the thoughts of others.

2) **Explanations by meaning** amplify the meanings of particular words or phrases. So, for example, someone might explain that mentations are unseeable, because they are mental actions and, generally speaking, mental things are not visible.

3) Finally, **causal explanations** offer an understanding of how and why things came to be a particular way. These are the most common kind of explanation. For example, we might explain a car crash by appealing to the fact that the driver was speeding.

Explanations can be good, or bad. This is not the important point here though. What matters here is that explanations should not be confused with arguments.

Probably the most interesting and powerful kinds of argument are the so-called 'Deductive Arguments'. With this kind of argument, provided that the premises are true and the argument is 'good' (in a special way that will be discussed later), then the conclusions follow, with necessity. Indeed, if everything is in order with the premises and the structure of the argument, then we can be completely certain about the correctness of the conclusion. A classic deductive argument, and a 'good' one at that, is

"All whales are mammals, all mammals breath air, therefore all whales breath air."

One of the limitations of deductive arguments is that they do not provide evidence beyond what is contained in their premises. Sometimes, we need to make other kinds of inference. One of the most useful other kinds of inferences are made using 'Inductive Arguments'. When we make inductive inferences, we consider a number of cases of something and make an inference about future cases. This type of inference is very common in scientific reasoning. Inductive inferences are weaker than deductive inferences, as their conclusions are only probable. However, they do let us make inferences that go beyond the evidence directly presented in the premises. A classic example of an inductive argument would be

"Every crow I have ever seen has been black, so probably all crows are black."

Notice how in this case, coming across an albino crow should not be as big a surprise as it would be to come across a non-air breathing whale, in the previous example.

The final kind of argument that will be considered here will be **Arguments by Analogy**. Sometimes it is helpful to reason about something we do not know too much about, on the basis of something else, which we are much better acquainted with. It is in circumstances such as this that we deploy arguments
by analogy. As with inductive arguments, this types of reasoning only leads us to probable, or likely conclusions. An example of an argument by analogy might be

"In my car, the lever on the left operates the signal lights, hence it is likely that the left lever will operate the signals in this hire car."

The different kinds of arguments are worth knowing about, as the way they need to be assessed varies. They are also subject to different kinds of things that can go wrong with them. These will be examined later. To begin with though, it is worth spending a little time focusing almost exclusively on deductive arguments, as these are amongst the most powerful and potentially useful kinds of argument.

In closing, it is also worth mentioning that the various language uses mentioned earlier can often appear mixed together in particular utterances, or passages of prose. This is why it is worth spending a little time figuring out how to distill out the actual argumentative portions, so that they can be assessed independently of the other linguistic, or declarative acts, that would otherwise be distractions. This process will be looked at presently.

IV. Good and Bad Deductive Arguments

It has been noted that deductive arguments, provided they meet certain standards, have the advantage of having their conclusions follow necessarily from their premises. Thus, they are a particularly powerful type of argument. At this point it would be handy to know a little bit more about what makes a deductive argument a 'good' one.

When we are presented with an argument, we need to figure out a way of determining whether or not we should be persuaded by it. Most people have some instinctive capacities for doing this. However, it would be nice to have a methodology that was a little bit more robust and precise.

When people are presented with arguments, one of the strategies they may use to assess them is what is sometimes called the 'Yum-Yum, Yuck-Yuck' approach. That is to say, people try and determine the extent to which the conclusion of the argument agrees with their pre-existing beliefs on the subject. If the conclusion is in agreement with their beliefs, then the argument is accepted (i.e. 'Yum-Yum'). If the conclusion of the argument is at odds with their pre-existing beliefs, then the argument is rejected (i.e. 'Yuck-Yuck').

There is also a slightly more sophisticated version of this strategy, in which, if the argument is not consistent with pre-existing beliefs, then one of the premises of the argument is rejected, or attacked.

One drawback of this approach to argument assessment is that it means that it will be difficult for a person to be persuaded to change their views on a matter, even if their views are seriously defective. Fortunately, there is a better, more sophisticated way of assessing deductive arguments, than the simple Yum-Yum, Yuck-yuck strategy.

In order for an argument to be a 'good' one, two thing really need to happen. First, it must be the case that the conclusion actually follows from the premises. Second, the premises should be true (or at least, reasonable). Being aware that there are in fact two things in play when assessing an argument, is actually quite an important insight.

It is now time to introduce a two-stage process for assessing deductive arguments. In order to do this, it
is necessary to introduce two slightly technical concepts, 'validity' and 'soundness'. Let us begin by looking at the formal definitions of the two concepts:

An argument is *Valid* if, and only if, it is not possible for the premises to be true and the conclusion false.

An argument is *Sound* if, and only if, it is valid and has true premises.

Sound deductive arguments are the 'good' ones. When an argument is sound, then it is one of those situations in which the conclusion necessarily follows from the premises.

The fact that the validity of the argument is a condition that needs to be satisfied in order for the argument to be sound, suggests that validity should always be considered before soundness. After all, if an argument is non-valid, the truth or falsity of the premises are simply irrelevant. The argument is simply not a good one. However, this insight rather turns intuitive argument assessment approaches on their head.

The notion of validity also deserves a little discussion. One of the things that people find a little bit odd about it is that, as the definition is phrased, the *actual* truth or falsity of the premises is irrelevant to an argument's validity. This is because the soundness phase takes care of this issue. Validity only concerns the relationship between the premises and the conclusion, irrespective of the truth, or falsity of the premises.

This approach to assessing deductive arguments has one or two surprising consequences. For example, the following argument is valid (though not sound),

If the Moon is made of green cheese, then the New Orleans Saints will win the Superbowl. The Moon is made of green cheese. Thus, the New Orleans Saints will win the Superbowl.

The reason this argument is valid will be discussed presently (to anticipate, it is an instance of a *Modus Ponens* inference). However, it is pretty clear that the argument is not sound, given that there does not seem to be any real connection between the composition of a celestial body and the performance of a professional sports team. It is also rather improbable that the Moon is made of green cheese.

Another curious consequence of the definition of validity is that any argument with contradictory premises, will be valid! Consider the following argument, to see why this is the case.

All snails are slimy. Some snail is not slimy. Thus, The President of the United States is a Walrus!

From the fact that it can never be possible for the premises to be true and the conclusion false (as the premises can never be true at the same time), it follows that the argument is valid (though not sound). This slightly curious phenomenon is sometimes called *'The explosiveness of contradictions'*'. The argument would remain valid, whatever the conclusion drawn. We could replace the conclusion above, for example, by 'The nothingness negates itself' and the argument's validity would remain unchanged. This is one of the reason why contradictions are seen as being so problematic in philosophy.

It turns out that, although the notion of validity is a bit odd, it is a very useful tool which can be used to
detect entire classes of argument that are always going to be valid, or invalid, irrespective of what the arguments are about.

V. Valid Argument Forms

The slightly technical concepts of the validity and soundness of deductive arguments should now be familiar. Although these ideas may initially appear a little abstract, they turn out to be extremely useful.

It turns out that it is possible to determine the validity of some arguments, merely in virtue of their 'form'. By 'form' here is meant roughly the arrangement of various components of the argument and their relations with respect to certain words which perform special logical functions. Here it is useful to introduce a method for representing argument forms in a manner that makes their structure explicit. The usefulness of this method can then be illustrated with some examples.

It turns out that certain words have a rather precise and predictable effect upon the sentences over which they operate. An important subset of these words are the so-called 'logical connectives'. We can get a rough and ready idea about logical connectives, by considering the logical role played by the word 'not', in a sentence. 'Not' is one of the more familiar logical connectives.

Suppose we have a sentence like "The cat is on the mat". This sentence will be true in cases when the proverbial cat is indeed on the mat. However, if we add the word 'not' to the sentence, thereby transforming it to "The cat is not on the mat", should the sentence have been true previously, it would now be false. Conversely, had the sentence previously been false (say, due to cat sitting nowhere near the mat), then the reformulation would make the sentence true. This demonstrates how the effect of adding 'not' to a sentence has a fairly obvious and predictable effect upon the truth of the sentence.

Now, by this point, you might be wondering why it is worth bothering to consider such a blindingly obvious example. One reason it is useful to consider this example is because it offers an intuitive method to introduce a rather useful little technical 'trick', known as 'symbolization'.

The first thing to notice about the sentence, "The cat is not on the mat", is that it is exactly the same, in terms of it's truth and falsehood conditions, as the sentence, "It is not the case that the cat is on the mat." Now, if we suppose that we will let the letter 'S' stand for the entire sentence "The cat is on the mat", then we can rewrite the sentence, after we have added the not (in the second formulation) as simply 'Not S'.

At first, this move might look kind of silly and trivial, however it is not. It makes it possible to state abstract truths about whole classes of sentences. This is because we could change the interpretation of S to something completely different, for example, "Summer is 'a coming in." and the logical facts would still remain the same. Consider the following abstract logical claim,

"Whenever a sentence 'S' is true, the sentence 'Not S' will be false, and when a sentence 'S' is false, the sentence 'Not S' will be true."

Notice how this claim remains true, regardless whether 'S' is interpreted as being "The cat is on the mat", or as being "Summer is 'a coming in." This trick makes it possible to make abstract statements about entire patterns of arguments. Moreover, this trick provides us with a handy shorthand with which we can identify valid patterns of inference.
Before proceeding any further, a few more words about this process of symbolization are in order. Traditionally, philosophers use the letters P, Q and sometimes R, when identifying patterns of inference. The reason why these letters are used have never been explained, but it is useful to know the convention, so that other sources will be compatible with what is said here. This convention will be followed here. The second point to note is that these letters stand for entire propositions. That is to say, things that can be said as complete statements.

Now, we are ready to start looking at some simple patterns of valid inference. Let us begin by considering the way another special logical word functions, the word 'and'. Let us suppose that we happen to know that the sentence, "Peas contain chlorophyll", is true (as, in fact, it is). We will symbolize it with the letter 'P'. Let us also suppose that we also know that the sentence, "Tonic water contains quinine", is true (as, again it is), and symbolize it with the letter 'Q'. Under these circumstances, we could validly infer "Peas contain chlorophyll and tonic water contains quinine", or in symbolic form 'P and Q'. We can express this inference a little more clearly, if we put each premise, in symbolic form, on a separate line. Doing this results in the inference looking like this,

\[
P, \\
Q, \\
\text{Thus,} \\
P \text{ and } Q
\]

This is a valid inference, no matter what sentences are substituted for the letters P and Q. This inference is sometime called 'conjunction'. For an exercise, you might have some fun coming up with other conjunctive sentences.

On the face of it, again this may seem a little bit on the trivial side. This impression is somewhat misleading though. Consider a circumstance in which an investigator is looking into the cause of an odd chemical reaction. The investigator might hypothesize that the reaction has been caused by the interaction between chlorophyll and quinine. Under such circumstances this inference might be made to show that both compounds were present in some mixture containing both peas and tonic water.

It turns out that this inference also works 'the other way'. That is to say that the two inferences, 

\[
P \text{ and } Q, \\
\text{Thus,} \\
P
\]

\[
P \text{ and } Q, \\
\text{Thus,} \\
Q
\]

are both also valid. Inferences of this kind are called 'simplification inferences'. The really neat thing here (as with the previous case), is that the propositions we substitute for 'P' and 'Q' have no influence on the validity of the inference. To demonstrate this with a slightly silly example, the inference 'bong bongo and pielie pielie, thus bongo bongo', is also valid!

Now that this method of symbolizing arguments has been introduced, it turns out that it can be used to look at more complicated and interesting kinds of inference also. As the complexity of the inferences increases, the true power of this method begins to become apparent.
VI. More Valid Argument Forms

We have already seen the conjunction and simplification valid argument forms illustrated, using the convention of letting letters stand for entire propositions (things that can be said as complete statements). This convention will continue to be used here. The topic of certain special logical words, that have very predictable effects upon the sentences in which they appear, has also been discussed. The words 'Not' and 'And', which fall into this class of special logical words, are not the only examples of such terms.

Another important logical word is the word 'Or'. There is a minor complexity that arises with 'Or', though. It turns out that natural language contains two logically distinct versions of 'Or'.

The first kind of 'Or' is called 'inclusive Or'. Sentences that contain an inclusive Or are true when either of the disjuncts (that is to say, the propositions either side of the Or) are true, as well as when both disjuncts are true. Consider the sentence

"Sammy will bring ham or cheese to the potluck dinner".

This sentence would not be false, if it turned out that Sammy brought a ham and cheese plate. In this case, 'Sammy will bring ham' is one disjunct, while 'Sammy will bring cheese' is the other disjunct. This illustrates the way 'inclusive Or' functions in language. Generally speaking, it is usually assumed that this is the default type of 'Or' people use, when speaking in natural language.

The second kind of 'Or' is known as 'exclusive Or'. For the purpose of disambiguation, this is usually written 'Xor'. This practice will be followed here. Sentences which have an Xor between their disjuncts are only true when one of their disjuncts are true, but not when they are both true. In common speech, the use of Xor is often marked by the use of the phrase "Either...,or...". Suppose one was to go out to dinner and the server was to say,

"Your meal comes with either a salad, or coleslaw. Which would you like?"

There would certainly be some surprise if one was to ask for both salad AND coleslaw! For the most part, in what follows, the inclusive use of 'Or' will be assumed. However, the fact that Xor can show up from time to time is a reason to be a little careful about sentences and arguments that use 'Or' as a connective. When one sees an 'Or' in an argument, it is always worth pausing a moment to try and work out which kind of 'Or' is intended.

Now attention can be turned to valid patterns of inference that involve the use of Or. The first of these to consider is the so-called 'Addition inference'. Following the conventions introduced earlier, this kind of inference has two variants, which can be represented as follows:

P
Thus,
P or Q
Q
Thus,
P or Q

On the face of it, this may appear a bit of an odd inference, albeit a valid one. If one knows that a particular proposition, P is true, then we can infer that 'P or Q' is also true (actually, the same holds with false sentences -- valid inferences are 'truth-value preserving', in more technical language). So, if one knows that, for example "The sky is blue", it is valid to infer that "The sky is blue, or grass is green".

The apparent oddity of addition inferences notwithstanding, there are occasions when this kind of inference can be useful to make. There are a number of cases in the philosophical literature where inferences of this kind have been crucial to developing philosophical objections to positions. A particularly famous case in which this kind of inference was crucial is the so-called Gettier Problem, which is important for certain philosophical theories about knowledge..

Much more common than Addition inferences are 'Disjunctive Syllogism' inferences. These too are valid and crucially contain the word 'Or'. Disjunctive syllogism inferences also come in two varieties. The forms of this kind of inference are as follows:

P or Q
Not P
Thus,
Q

P or Q
Not Q
Thus,
P

This kind of inference is actually quite important in everyday life. As such, it should not seem too strange. Suppose that one is hoping to meet a friend, but one is unsure where they will be. One might reason as follows,

"At this time of day, Robin will be in the office, or in the park. I just called the office and there was no reply, so I had better go and look in the park."

In this case, P corresponds to 'Robin will be in the office'. Q corresponds to 'Robin will be in the park'. The fact that the office phone went unanswered, suggests that 'It is not the case that Robin is in the office' (i.e. Not P). So, we are led to the conclusion that 'Robin will be in the park' (i.e. Q). It is relatively easy to see that this kind of inference is valid, as we are most likely very familiar with it. However, we now have a much deeper understanding of why this is a 'good' inference.

Another important class of valid inferences occur with 'If..., then...' statements. If we think about how sentences with 'if..., then...' function, it becomes clear that provided some condition is met (the bit after the 'if...'), some other thing (namely, the bit after the 'then...'), follows, or will happen. It is useful to have some special terminology to talk about the different parts of this kind of sentence. By tradition, the part after the 'If...' is known as the 'antecedent' and the part after the 'then...' part is known as the 'consequent'. With this terminology, we can now say that with sentences of this kind, provided that the antecedent condition is met, the consequent result will follow.
Probably the best known kind of inference involving if...then... sentences is an inference known as 'Modus Ponens'. The form of a Modus Ponens inference is as follows;

If P, then Q  
\[\text{P} \Downarrow \]  
Thus,  
\[\text{Q} \Downarrow \]

Consider as an example the inference that,

"If the telephone is ringing, then there is someone trying to call. The telephone is indeed ringing. Thus, there is someone trying to call."

There are many similar inferences we can think of. Any inference that follows this pattern though is going to be valid, as all Modus Ponens inferences are valid.

One thing that is important to keep an eye on though is that the various parts of the argument are all in the correct places. For instance, the inference "If P, then Q, Q, thus P", is invalid. This would be an instance of the fallacy of 'affirming the consequent'. This is not a truth-preserving inference. This can be seen by substituting the phrase 'it is raining' for P, and 'the streets are wet', for Q. In this case, while it is often true that 'If it is raining, then the streets are wet', we can think of instances when the streets are indeed wet, yet there could be another cause (for instance, they could be cleaning the streets with water jets). This shows that affirming the consequent is not a valid kind of inference. However, if one reflects a little about the valid instance, with the same phrases substituted for P and Q, then the truth preserving nature of the inference is quite apparent.

Another important kind of valid inference involving 'if...,then...' are so-called 'Modus Tollens' inferences. These inferences take the following form,

If P, then Q  
\[\text{Not Q} \Downarrow \]  
Thus,  
\[\text{Not P} \Downarrow \]

On the face of it, it may appear surprising that this kind of inference is valid, given that in many ways it appears similar to inferences that involve affirming the consequent. A more concrete example may help here. Consider once again the case when P is the phrase 'it is raining' and Q is the phrase 'the streets are wet'. In this case the inference would be,

"If it is raining, then the streets are wet. The streets are not wet. Thus, it is not raining."

This is notably different from the affirming the consequent cases, due to the inclusion of the 'not'. It is also the case that, intuitively, this seems like a pretty reasonable inference.

One thing to realize is that it is not absolutely necessary that the word 'not' appears in the second premise. What really matters is that the second premise and the conclusion are opposite (in terms of their negated, or unnegated status), from the values the same letters take in the first premise. We can see this by considering the following example, which is hopefully somewhat intuitive. Suppose a parent
were to say to their child,

"If you do not clean up your bedroom, then you will not get your allowance."

This would form the first premise of the Modus Tollens inference. We can the imagine the child reasoning,

"I want my allowance, thus I must clean up my bedroom."

It is worth mentioning in closing that some people find Modus Tollens inferences notoriously hard to teach, compared to Modus Ponens inferences. Thus, it may be worth spending a little time thinking about this kind of inference, to ensure that it is sufficiently well understood.

The final classic class of inferences involving 'If...then...' that are valid are so-called 'Hypothetical Syllogism' inferences. These inferences have the following form,

If P, then Q
If Q, then R
Thus,
If P, then R

This inference type is much more obvious than Modus Tollens inferences. The following little argument would be a case of a valid Hypothetical Syllogism inference.

"If there is rain tomorrow, then the picnic will be canceled. If the picnic is canceled, then my salad will go to waste. Thus, if there is rain tomorrow, then my salad will go to waste."

This inference is valid and also quite intuitive.

The great thing about knowing about all these valid argument forms is that they enable us to pretty quickly spot valid arguments in natural language. If an argument matches one of these forms, it is valid! Simple as that. However, before we can become really skilled at spotting these kinds of valid arguments in the real world, there is one further complication that needs to be addressed, concerning missing premises and conclusions. They make things just a little bit more complicated.

VII. Enthymemes

There is one further complexity that arises with real world arguments, that has yet to be mentioned. This concerns the fact that, in daily life when people are arguing, they do not necessarily explicitly include all the parts of the argument in what they say, or write. One thing that you may have noticed with the valid argument forms is that they seem to involve rather a lot of repeating the same phase over and over again. For instance, in a Modus Ponens inference, the phrase symbolized by P in the argument form appears in both the antecedent of the first premise and in the second premise. In practice, people seldom talk, write, or reason this way. Instead, it is common for people to take little logical 'short cuts'. Consider the following two passages of text,

(a) "If it is cloudy, then the solar cell will not work well, so it won't work well today."
(b) "If it is cloudy, then the solar cell will not work well. It is cloudy today. So, the solar cell will not work well today."

Essentially, (a) and (b) make the same argument. Notice though that passage (a) sounds much more natural, while the version in passage (b) sounds kind of leaden and overly pedantic. The reason for this is pretty obvious. Passage (a) uses contractions, and does not explicitly state the second premise. Passage (b) sticks much more closely to the valid argument form. On the face of it, it would seem that if the version in passage (b) is a valid instance of a Modus Ponens inference, then that would seem to guarantee the the version in passage (a) was valid also. Yet, there is a bit missing. What is going on here?

The version of the argument that appears in passage (a) contains an *Enthymeme*. This term has a Greek origin and means roughly 'in the mind'. It turns out that in many cases in natural speech and writing, we do not have to explicitly state all the parts of the argument, because we are able to easily and almost automatically, fill in the missing parts, with our minds. However, this adds a further complication to identifying valid arguments in real world reasoning.

The very automatic nature of the way we fill in missing parts of arguments can actually make it a little bit difficult to spot enthymemes at first. However, knowing the valid argument forms makes finding enthymemes just a little bit easier. Enthymemes need to be treated with care, however. This is because letting a reader, or hearer fill in missing parts of an argument can serve to hide from explicit scrutiny fairly dubious premises and conclusions. Consider the following argument,

"Gun control legislation is a restriction on freedom, so it shouldn't be passed into law."

As stated, this argument lacks any of the special logical words mentioned in the valid argument forms, discussed so far. Thus, it does not appear to match any of the valid argument forms and might therefore be tempting to classify as a case of an invalid argument. However, such a conclusion would be hasty, for two reasons. First off, there are valid arguments that do not (obviously) follow one of the valid argument forms, we have seen so far. Second, although there is pretty obviously something amiss with the argument, being invalid is not actually the problem in this case. A detailed consideration of enthymemes in this instance can clarify the real problem here.

One of the principles that is useful when dealing with enthymemes is the so-called *Principle of Charitable Interpretation*. The idea here is that it is easy to make an argument look bad. However, if an enthymeme can be added that would make an argument a valid one, then it is reasonable to add that enthymeme. If the premise 'If something is a restriction on freedom, then it should not be passed into law' were added to the above argument, it would appear to be a valid case of a Modus Ponens inference. After doing this, we can write the argument out more formally as follows,

1. If something is a restriction on freedom, then it should not be passed into law.
2. Gun control legislation is a restriction on freedom.
Thus,
3. Gun control legislation should not be passed into law.

By convention, enthymemes have their number underlined, to make them stand out, when arguments are written out in this more formal explicit manner. With the argument written out like this, we can now see that the argument is a valid instance of a Modus Ponens inference. However, we can also see that there is something very wrong with the first premise. After all, all legislation has the effect of
restricting freedom in some way! My 'freedom' to drive at any speed I feel like is restricted by speed limit laws. My 'freedom' to steal your stuff is restricted by laws about theft. Thus, the premise is patently false. However, when the argument is made without this premise being explicitly stated, people may not realize how silly it is and may be fooled into accepting the conclusion of the argument. This nicely illustrates why it is important to explicitly identify enthymemes and why they need to be handled with particular care.

Let us consider another example. This one comes from the real world. Some years ago some group stated putting up notices around various campuses that simply said "Jesus or Hell." It is not unreasonable to think that the people putting up these notices wanted to persuade people of something. Thus, these notices were probably supposed to provide arguments. The question is, what was the intended argument?

Noticing that the single premise has the word 'or' in it offers a clue. It is at least plausible that the posters of these notices intended their readers to perform a Disjunctive Syllogism inference. If this is correct, then there are two enthymemes, the second premise and the conclusion. So, the intended argument probably looked like this when presented more formally,

(1) Jesus, or Hell.
(2) Not Hell.
Thus,
(3) Jesus.

Of course, it could have been the case that the notices were posted by a local group of Satanists and the intended conclusion was "Hell"! In both cases, this would be a valid Disjunctive Syllogism inference (recall that there are two forms of this kind of inference). This is one of the incipient dangers of relying upon enthymemes. Readers and hearers may not draw the intended inferences.

Now, let us look at another, yet more complex, real world example. This one comes from an opinion piece written by Michael W. Brandl, that appeared on the InsideHigherEd web site (http://www.insidehighered.com) on the 2nd of Feb. 2007. Brandl is writing about the use of second hand textbooks by students. In the process of arguing his point, he made the following argument,

"To begin with, if every student were to buy only used textbooks then no new textbooks would be sold. Thus, no new textbooks would be produced, rapidly diminishing the quality of education."

The first thing to notice is that the conclusion (indicated by the term 'thus') concerns the production of textbooks and the quality of education. However, the consequent of the If...then,... premise concerns the sale of new textbooks. Thus, there needs to be something to connect these topics. One natural way to do this, would be to add another If...,then... premise. This can be done validly, by the inference called Hypothetical Syllogism. Notice also that Brandl also seems to think that it is reasonable to believe that 'every student [would] buy only used textbooks' ['were' is replaced by 'would' here, for reasons of grammaticality]. (This case has some similarities to passage (a), above). Having noticed these points, we can write out the argument more formally as follows,

(1) If every student were to buy only used textbooks, then no new textbooks would be sold.
(2) If no new textbooks would be sold, then no new textbooks would be produced, rapidly diminishing the quality of education.
Thus, [By Hypothetical Syllogism, from (1) and (2)]
(3) If every student [would] buy only used textbooks, then no new textbooks would be produced, rapidly diminishing the quality of education.
(4) Every student [would] buy only used textbooks.
Thus, [By Modus Ponens, from (3) and (4)]
(5) No new textbooks would be produced, rapidly diminishing the quality of education.

This example is quite complicated, but notice how we have ensured that the argument at least has the virtue of being valid. However, it is questionable whether the argument sound. For instance, it seems rather unlikely that a circumstance would arise under which every student would buy only used textbooks. Thus, by carefully rooting out the enthymemes in this argument, we are in a much better position to figure out whether or not we should be persuaded by it.

Enthymemes are an important feature of real world arguments, although they may not be immediately obvious to the unsophisticated reader, or hearer. Thus, understanding a little about enthymemes may help us in improving our own reasoning and gives a powerful tool to assist with analysis of the arguments of others.

**VIII. Arguments in the Wild**

Even with a knowledge of the valid argument forms and how enthymemes operate, it can still be quite tricky to spot arguments when they appear in entirely natural environments. There are a number of reasons why this is the case.

When arguments are looked at in discussions such as these, the examples discussed are usually carefully chosen so that the salient features of the arguments are obvious. When people use arguments in more natural contexts, they do not do this. For instance, it is not uncommon for arguments to be mixed up with passages of text that do other things, such as describing and commenting. This means that it is often necessary to disentangle argumentative text from the non-argumentative text. This is not always a straightforward process. For this reason, a few tips for recovering the 'meat' of arguments, when they appear in natural environments, are in order at this point.

It is worth briefly noting that these techniques are mostly focused upon written text. However, in theory at least, they should work just as well for spoken arguments. However, as spoken arguments are a little more tricky to work with, it is often useful to develop argument detection skills on written texts first. Once good skills are developed with this type of text, applying these skills in spoken cases often comes quite naturally.

When faced with a passage of text, the first thing that one needs to ask oneself is whether or not there is really an argument there at all. This might seem silly on the face of it, but it is important. There is little virtue in going to all the trouble of analyzing a putative argument, if one then realizes that there is no such thing present. It is also important to read the passage of text several times, to get a really clear idea of what is going on with it.

Arguably, the most important feature of a passage of argumentative text is that the text is trying to persuade the reader of something. This 'thing' is the conclusion of the argument. Given the importance of the conclusion, one useful technique is to ask yourself what a passage under consideration is trying to persuade you of. If there does not seem to be any one thing in particular, then it may be the case that the text is not in fact an argument after all.
One of the important distinguishing features of conclusions of genuine arguments is that they are often surprising, controversial, or counter-intuitive. This is a useful fact to know and keep in mind. When you think that you have found the conclusion to an argument, ask yourself whether the putative conclusion really has these features. If it does not, then that too is a clue that there may be something else going on in the passage. It is also worth keeping in mind that the main conclusion to an argument may not be explicitly stated in the argument. That is to say, the main conclusion can also be an enthymeme.

People sometimes have a bad time picking out conclusions when they are first starting out learning about arguments. Again there are a couple of useful tricks that can come in handy to help spot conclusions.

The first trick is to know that it is most common for the conclusion of an argument to appear either at the beginning, or the end of the argument. There are exceptions to this, but this is by far the most common situation.

Perhaps the most important clues for finding the conclusion of an argument come from so-called 'conclusion indicator' words and phrases. Now, it is not always the case that arguers will use indicators, but when they do, this can be a great help. The following words and phrases are common conclusion indicators:

* therefore
* thus
* so
* hence
* it follows that
* it can be inferred that
* in conclusion
* accordingly
* for this reason
* on these grounds
* consequently
* proves that
* shows that
* indicates that
* we can conclude that
* we can infer that
* demonstrates that
* in consequence
* as a result
* which means that
* which entails that
* which implies that
* leads to the conclusion that

Once the conclusion of an argument has been detected, it is worth checking and making sure that one really has found the main conclusion.

It is reasonably common for complex real world arguments to contain sub-arguments. We saw this in
the case of the argument about textbooks, already discussed. Sub-arguments are arguments that are embedded into larger arguments, which offer arguments in support of premises of the main argument. Thus, the sub-conclusion of a sub-argument, will often be a premise in the larger argument. This can make things, at least in theory, fairly complicated. There is no reason in principle why there could not be sub-sub-arguments and so on. Fortunately, these are seldom seen in practice. However, the presence of sub-arguments makes it possible to confuse a sub-conclusion with the main conclusion. This should be kept in mind when hunting for conclusions in real world situations.

Once the main conclusion of an argument has been found, it becomes easier to work out which other parts of the argument are functioning as premises. This in turn helps in the identification of the passages of text that do not really belong to the argument proper. Some people find it helpful to lightly strike through the irrelevant parts of the text, as they try and tease the argument out of the passage they are considering.

By following these strategies, looking for valid argument forms and keeping an eye out for enthymemes, with some practice, it can become relatively easy to dig arguments out from natural language passages. However, it is worth emphasizing that doing this is a skill and thus takes time to perfect. The best strategy for honing these skills is usually to practice these skills often, but only for brief periods at a time. It is worth making the effort, as these are very important skills for improving one's reasoning.

IX. Acceptable Premises

So far, the focus has largely been on the formal properties of deductive arguments, especially with respect to validity and invalidity. However, another important feature that has an important effect upon whether or not we should be persuaded by an argument, is the truth, or otherwise of the premises. When a valid deductive argument has true premises, it is sound and thus should be considered persuasive.

It turns out that figuring out the truth, or otherwise, of premises is a little bit more tricky than one would originally realize. Consider an argument that uses the claim that,

"The rate of acceleration due to Gravity is 9.8 meters per second squared."

Is such a premise true? Well, the answer is really 'sort of'. A more accurate value would be 9.81 meters per second squared. Does this mean that the premise is false? Again the answer is something like 'not exactly'. The problem here is that the precision that is appropriate in the premise will rather depend upon the context.

This is not the only kind of trouble that can arise when assessing the truth of premises. This fact was tacitly recognized by Ambrose Bierce in The Devil's Dictionary, where the following cynical definition of truth was offered,

"TRUTH, n. An ingenious compound of desirability and appearance. Discovery of truth is the sole purpose of philosophy, which is the most ancient occupation of the human mind and has a fair prospect of existing with increasing activity to the end of time."

Thus, assessing premises for 'truth' is perhaps not the best way to go. A good alternative is suggested by Trudy Govier in her A Practical Study of Argument, (6th Ed.), Wadsworth (2005). Govier suggests that
premises should be assessed for 'Acceptability'. I will follow Govier's suggestion here. The reason that checking for Acceptability if preferable for checking for 'Truth', is that Acceptability is a more pragmatic standard.

Govier offers a number of tests that can be used to determine whether premises are acceptable, or not. If these tests are used, then a reasonable set of strategies for assessing premises result. It is worth emphasizing that it is really important that each premise must be assessed. It is also important that one think carefully to determine whether or not a particular premise really satisfies each test. Sometimes, it can even be helpful to construct a little argument to make sure! Also, just because a premise does not appear to satisfy one of these tests, is not sufficient to ensure that the premise is not acceptable. There is a separate set of unacceptability tests, that will be discussed later.

Govier's Acceptability Tests for Premises:

- Premises defended by cogent, or sound sub-arguments

If a premise is defended by a strong argument, then there is every reason to judge it acceptable. This should be obvious and uncontroversial. Of course, this puts the burden of acceptability back onto the strength of the sub-argument and the acceptability of the premises of the sub-argument.

- Premises defended elsewhere

It is often the case that premises will be defended in one place, and then used in another. For example this situation frequently arises in long texts. In some ways, this condition is just a variant of the previous one. This kind of justification appears in academic writing through the use of references and citations to articles in refereed academic journals and authoritative texts.

- Premises that are known a priori to be true

The idea behind a priori judgments is that there are some judgments that can be known to be true from the concepts alone, even prior to experience. To cite a couple of classic examples, if one knows that a particular object is a triangle, then one knows a priori that this object has three sides. Similarly, if one knows that a particular individual is a bachelor, then one knows a priori that the individual is unmarried. A priori judgments are not entirely uncontroversial. However, in the current context, this can still be a useful test for acceptability.

- Premises that are commonly known to be true

There is a class of premises that are not a priori truths, but nonetheless everyone knows to be true. For instance, most people will agree that, under the appropriate viewing and climatic conditions, the sky is blue. Similarly, most people will agree that, at least in temperate latitudes (the polar regions present problems here), there is less light at night than there is during the day.

- Premises that are supported by appropriate personal testimony

This condition is useful, but can be a bit tricky. Generally speaking, accepting premises using this test, should only be done if (i) the claim is not implausible, (ii) the source of the claim appears reliable, and (iii) the claim made does not go beyond a person's reasonable experience.
- Premises that are supported by a claim to proper authority

There are experts in the world. Generally speaking, their claims can be accepted. However, it is important to consider the extent to which the authority is a reasonable and credible person in the context. For instance, a professor may make a claim about an issue. However, if the issue is outside their specialized area of training and expertise, then the claim would not be acceptable.

- Premises that are provisionally acceptable

Sometime, in the context of a real argument, it is just not possible to determine whether a particular premise is true, in the context in which the argument is being offered. In such a case, it is not unreasonable to accept the premise only provisionally. For instance, people are often doing this kind of thing when they say things like 'for the sake of argument...'.

These tests are really quite useful when used in practice. However, having a bit of experience trying using these tests can make things easier. Doing a few practice exercises is strongly recommended here. However, once a person has become reasonably familiar with these tests, determining which premises to accept and which to reject becomes considerably easier. As this is an important step in determining whether one should be persuaded by an argument, it should assist in analyzing the reasoning of others and help us construct stronger arguments of our own.

X. Unacceptable Premises

Just as there are a number of tests that can be used to determine when premises should be counted as being acceptable, there are also a number of ways that premises can be unacceptable (again, Govier is being followed here). As with acceptable premises, it is important to have a number of different tests. Also, it is important to ensure that a particular premise really does fail due to passing one of these tests. It is for this reason that it is sometimes useful to be able to give an argument as to why a particular premise is problematic.

There may be cases when a premise may appear to be intuitively unacceptable. However, when one considers the premise carefully, it may turn out to be less problematic than it initially appeared. There may even be cases where a particular premise does not seem to satisfy either an acceptability, or an unacceptability test. Although such cases are inherently problematic, this is the kind of case where the correct course of action is to consider the premise provisionally acceptable, pending further information.

Govier's Unacceptability tests for premises:

- Premises that are easily refuted

If a premise is offered that can easily be shown to be false, then pretty obviously the premise will count as being unacceptable. A very effective method for doing this is to be able to offer a counter-example. It is also worth noting that the broader the claim made in a premise, the easier it is to counter in this manner. Thus, when considering arguments, it is always worth being on the look out for extremely broad premises. Now, let us consider an example. Suppose someone were to offer, as part of an argument, claims like,

(a) "All members of outlaw motorcycle club are illiterate", or
(b) "British people are all extremely proper and polite".

We could reject (a), as Ian 'Maz' Harris was a member of the British Hells Angels motorcycle club, yet had a Ph.D. It is not possible to get a Ph.D. if one is illiterate. We could similarly easily refute (b) by noting that Ozzy Osbourne is British. Osbourne is manifestly neither 'extremely proper', nor particularly 'polite'.

- Premises that are a priori falsehoods

There are cases where premises can simply be obviously false. Consider a case where someone appealed to the idea of a four-sided triangle in an argument. The very idea of a four-sided triangle is obviously nonsense, thus it would make no sense to accept a premise that appealed to such a notion. Other cases can be more subtle, however. Consider the case of an argument which rested upon the following premise,

"If something is a restriction on freedom, then it should not be passed into law."

We have seen something exactly like this before, when discussing enthymemes. On the face of it, this premise might seem vaguely plausible, if one was to think about all the rights and freedoms that are guaranteed by various nations. However, a little reflection shows that such a premise is problematic. This is because it is the very nature of laws, that they restrict freedom. My 'freedom' to drive too fast, for example, is restricted by speed limit laws.

There is another type of case which also falls under this test. If two premises explicitly contradict one another, then they should both be rejected (unless one is obviously true and the other obviously false). Consider, the following argument,

(1) Sentence (2) is false,
(2) Sentence (1) is true,
Therefore,
(3) The nothingness negates itself.

It turns out that together, sentences (1) and (2) form an instance of a famous philosophical puzzle known as The Liar's Paradox (this is often formulated more simply in the sentence 'This sentence is false'). It is pretty clear that these two sentences above are problematic and as such should be judged unacceptable. There is an interesting point to note though, it turns out that the conclusion (3) actually follows validly from the two premises! This is due to the definition of validity. To put the matter simply, given the contradictory nature of the premises, it is never going to be possible for the premises to be true and the conclusion false, thus the argument is valid.

- Premises that contain implicit inconsistencies, or are problematically vague or ambiguous

Sometimes premises can be implicitly inconsistent with one another. Such cases are subtle and take some practice is detecting. However, suppose someone is giving an argument about the negative effects of a proposed trade policy. Supposed in one premise it is assumed that trade is going to increase, but in another that trade would decrease, both allegedly bringing about negative effects. In such a case, we would once again be justified in claiming that the premises were unacceptable.

Ambiguity can also be problematic and render a premise unacceptable. Consider for example the
following rather silly claim spotted on a blog (a tragically bad one) some time ago,

"Academic feminists are not feminists."

This claim is somewhat odd. After all, a tabby cat is still a cat. What seems to be going on here is that the author intends the second use of the term 'feminists' to mean something rather different than the usual meaning, that is invoked by the first use of the term. It is pretty clear that this claim is basically incoherent and thus the premise should be ruled as unacceptable. Analogous difficulties can arrive when premises are irredeemably vague.

- **Premises that are as dubious as the conclusions they support**

Recall that the conclusions of arguments are usually controversial, surprising, or counter-intuitive. If an argument rests upon premises that are as dubious as the conclusions they purport to support, such premises should also be rejected as unacceptable. This situation is illustrated by the following argument,

"Since his alleged death, many people have reported sighting Elvis Presley in a variety of locations and situations in the continental United States. As the well-known aphorism has it 'There is no smoke without fire', so there are grounds for believing that Elvis Presley is still alive and well and living amongst us."

The conclusion here, that 'Elvis Presley is alive and well and living amongst us', is just a little surprising. However, the fact that people claim that they have seen Elvis is equally surprising (after all, they could be confusing Elvis impersonators for the real thing). Thus, the claim about Elvis sightings should be deemed unacceptable under this test.

- **Premises that beg the question**

If an argument tries to argue for a conclusion, by assuming the conclusion, then this too would render the argument problematic. This is handled by deeming the premise that encodes the conclusion as unacceptable. For example if someone attempted to argue,

"Orange is green, therefore orange is green."

we are unlikely to be too impressed. It is worth noting though that few cases are as blatant as this. A more subtle case, which is more like a real world example might be something like,

"It is unfair to raise our taxes, therefore it is unjust to do so."

Here, fairness and justice are considered as being close synonyms for one another. Given this, anything which is unfair, will also count as being unjust. The plausibility of these claims need not be further investigated here though, as it is intuitively obvious that this so-called argument is a question begging one.

There is in fact a very famous argument for the existence of God that suffers from just this kind of problem. It is known as the Ontological argument, originally proposed by Anselm. There are many versions of this argument. I will offer one of the simplest formulations here. Consider the following argument,
(1) God is 'that than which nothing greater can be conceived'.
(2) This conception of God implies existence (as an existing thing is greater than an equal thing which
does not exist),
Therefore,
(3) God is that which cannot be conceived not to exist.

This is a classic case of a question begging argument. The fact that the conception of God specified in
(1), is stipulated to imply existence in (2), just begs the question. This is pretty obviously objectionable.

As noted earlier, when assessing a deductive argument, it is important to check whether the argument is
valid. If the argument is valid, then it is next important to check the acceptability of the premises. In
order for a premise to count as acceptable, it must pass one of the acceptability tests, discussed above.
If a premise appears not to pass any of the acceptability tests, then the premise should be checked
against the unacceptability tests. Only when a premise satisfies an acceptability, or an unacceptability
test, can we determine whether or not the argument is sound. These are a powerful set of tools.
However, they take a little practice to get the hang of applying in real world contexts. This is the reason
why practicing these skills is extremely important. However, with a little careful practice, the methods
and techniques discussed and introduced here can have a dramatic effect upon one's ability to detect
faulty reasoning in the arguments of others, as well as offering methods to ensure that you construct the
very best arguments for your own positions.