

CHAPTER 1: LOGICAL POSSIBILITY

41% of Americans surveyed in the 2005 Gallup Poll we considered in the last chapter believed in ESP (Extra Sensory Perception) and an additional 25% were not sure. Some however believe that ESP is impossible and should be dismissed out of hand: ‘Transmission of information through space’, writes Physicist Milton Rothman, ‘requires transfer of energy from one place to another’.

Telepathy requires transmission of an energy-carrying signal directly from one mind to another. All descriptions of ESP imply violations of conservation of energy [the principle that mass-energy can be neither created nor destroyed] in one way or another, as well as violations of all the principles of information theory and even the principle of causality [the principle that an effect cannot precede its cause]. Strict application of physical principles requires us to say that ESP is impossible.¹

Should we dismiss ESP as impossible, as Rothman suggests, without further investigation? It depends on how certain we are of these physical principles and even more interestingly, on what we mean by ‘possible’. Rothman, presumably, is claiming that ESP is *physically impossible*, that is, that ESP phenomena are incompatible with fundamental physical principles. Telepathy is not logically impossible. Moreover, even when it comes to our most entrenched beliefs, even when it comes to what we regard as scientific truth or commonsense, we may be mistake

1 RECONCILING OBSERVATION WITH ENTRENCHED BELIEF

Jefferson and the Yankees²

In the early 1800s news traveled relatively slowly. People did not get frustrated waiting 15 seconds for a page to load from 3,000 miles away. New information could take months or years to be collected, analyzed, published and distributed.

In the cold chill of a December morning in 1807, Judge Wheeler walked from his home in Weston, Connecticut, USA, and was surprised to see a ball of fire moving across the northern horizon. He watched as it passed to a point almost overhead where it flashed several times and disappeared.

¹ Milton A. Rothman, *A Physicist's Guide to Skepticism* (Buffalo: Prometheus Books, 1988), p. 193

² New England Meteoritical Service website at <http://www.meteorlab.com/METEORLAB2001dev/metics.htm> - Tomas

A few moments later he heard a great noise. Thunderous and roaring, the noise grew to a frightening level. He then heard the whizzing sound of something falling. As the judge looked up, he observed a small stone strike a nearby building, bounce off, and roll onto the grass. The judge decided to contact nearby Yale University and ask that the event be investigated.

Two very skeptical professors came out to look into the matter, fully prepared to dispel the story of stones falling from the sky. The two professors conducted a lengthy investigation. They knew these stones were different from any they had ever seen and they witnessed local townspeople extracting them from holes in yards and nearby fields. Finally, the two wise professors from Yale concluded the stones must have fallen from the sky.

Eventually the story found its way to the White House in Washington, D.C. President Thomas Jefferson was a scientist as well as statesman. When he heard this peculiar story he declared it could not be true, but his advisors insisted that the stones were observed falling from the sky and that two Yale professors investigating the incident vouched for its truth.

Thomas Jefferson, President of the United States, responded with great skepticism: "Gentlemen, I would rather believe that two Yankee professors would lie than believe that stones fall from heaven."

Whether Jefferson's quote is truth or myth, his belief real or an opportunity for a witty Virginian to take a shot at a two Yankees, is not known and not really that important. What is important is that the story reflects the mindset of a scientific community struggling to reconcile observation with entrenched belief.

2 POSSIBLE WORLDS

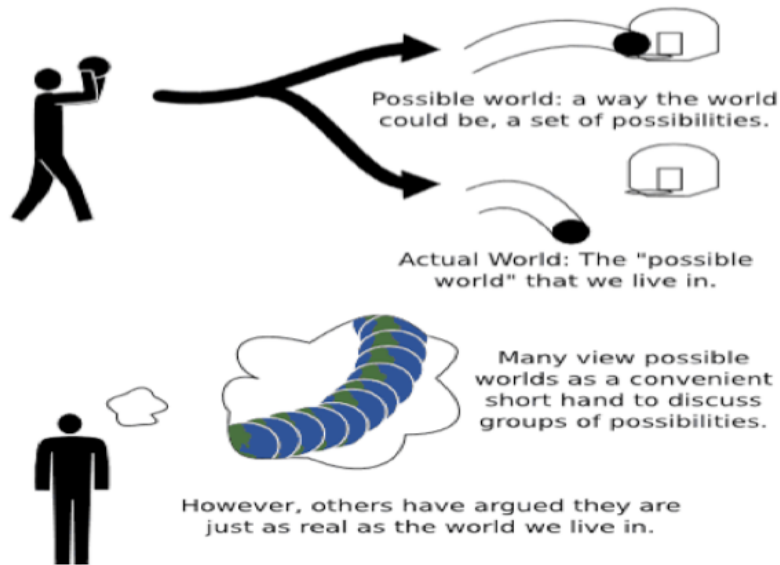
Meteorites were not only physically possible: they were actual!

For the purposes of logic, however, we consider possibility in a sense broader than physical possibility, namely 'logical possibility', so called not because it is somehow especially 'logical' but because it's the kind of possibility that we're interested in for the purposes of doing logic. Even if meteorites had been physically impossible—as Jefferson thought—stones falling from the sky would still be *logically possible* because that state of affairs is *conceivable*. Logical possibility is the kind of possibility that figures in logic and also in math, as when we ask whether it is 'possible' to trisect an angle using just a compass and straightedge. It isn't.³ It is, however, logically possible to identify an infinity of numbers between 1 and zero (get started!), even if it isn't physically possible for us mortals to do that.

In this chapter we're going to try to get at this notion of logical possibility. Then we'll return to consider whether ESP is possible and if so in what sense.

³ <http://mathworld.wolfram.com/AngleTrisection.html>

We use the terminology of *possible worlds* as a convenient metaphor for talking possibilities. As shorthand for saying that a proposition (or state of affairs) P, could have been, could be, or could come to be true, we say that there is some *possible world* at which P. If P in fact true, if is the way things actually are, we say that P is so at the *actual world*—which is one of those possible worlds, since whatever is actual is possible. I *could* have made that shot—but *in fact* I missed.



I missed that shot: that's the way things actually are. But I *could* have made it: even though I missed at the *actual world*, there is a *possible world* where I got the ball through the hoop!

But what in what sense *could* I have gotten the ball through the hoop? I *could* have thrown the ball through the hoop from the foul line. But could I have gotten it through throwing from the other side of the court? Or from 2 miles away? Or from another planet?

In one sense I could do all those things: all are *logically possible*. Logical possibility is possibility in the broadest sense: whatever is conceivable, whatever can be imagined or thought, is logically possible, even if it isn't *physically possible*. Physical possibility is a restriction on logical possibility. Everything physically possible is logically possible but not vice versa. So, it is *logically possible* for pigs to fly even though it is not *physically possible*—at least for normal pigs on earth. A state of affairs is *physically possible* if it is compatible with the laws of nature. It's not physically possible for anything to go faster than the speed of light—that violates a very deep physical law—but it is *logically possible* since we can imagine it.

To get at the difference between what we call 'logical possibility' and more restricted kinds of possibility, like physical possibility, we complicate the possible worlds picture a little further. We talk about which worlds are *accessible* from a given world or, alternatively, which can be 'seen' from that world.

2.1 ON BEING 'POSSIBLE AT A WORLD'

In general, a proposition (state of affairs), *P*, is *possible* at a world, *w*, if there is some world *accessible* to *w* at which *P* is true—that is, if *P* is true at a world that can be 'seen' from *w*.

We understand different kinds of possibility in terms of different *accessibility relations* amongst worlds or, if you will, in terms of how far into logical space we can 'see'. When it comes to *logical possibility*, we think of all possible worlds as mutually accessible so that we that we can 'see' every world from every other world: from the actual world I can 'see' all possible worlds, including worlds where I can successfully shoot baskets from 2 miles away and worlds where things can go faster than the speed of light. On the other hand, when we're talking about physical possibility, the only worlds that are accessible from the actual world are worlds where the laws of nature are the same as they are for us. So from the perspective of physical possibility I can 'see' those worlds at which I successfully shoot baskets from 12 feet away, but not ones where I get the ball in from 2 miles away or worlds where things go faster than the speed of light.

In general, when we consider which states of affairs are *physically possible* at a given world, *w*, we are concerned with only those worlds at which the laws of nature are the same as they are at *w*. So when we consider what is *physically possible* from our perch here at the actual world, we can 'see' only those worlds at which the laws of nature are the same as they are for us. When we consider which states of affairs are *logically possible* however we can see all over logical space to all possible worlds, including those where the laws of nature are not the same as they are for us at the actual world. From the perspective of logical possibility, we can see all possible worlds; from the perspective of physical possibility we can only see those in a smaller neighborhood—those in which the laws of nature are the same as they are at our world. Physical possibility is, therefore, possibility in a more restricted sense than logical possibility: everything physically possible is logically possible, but not vice versa. Summing up so far:

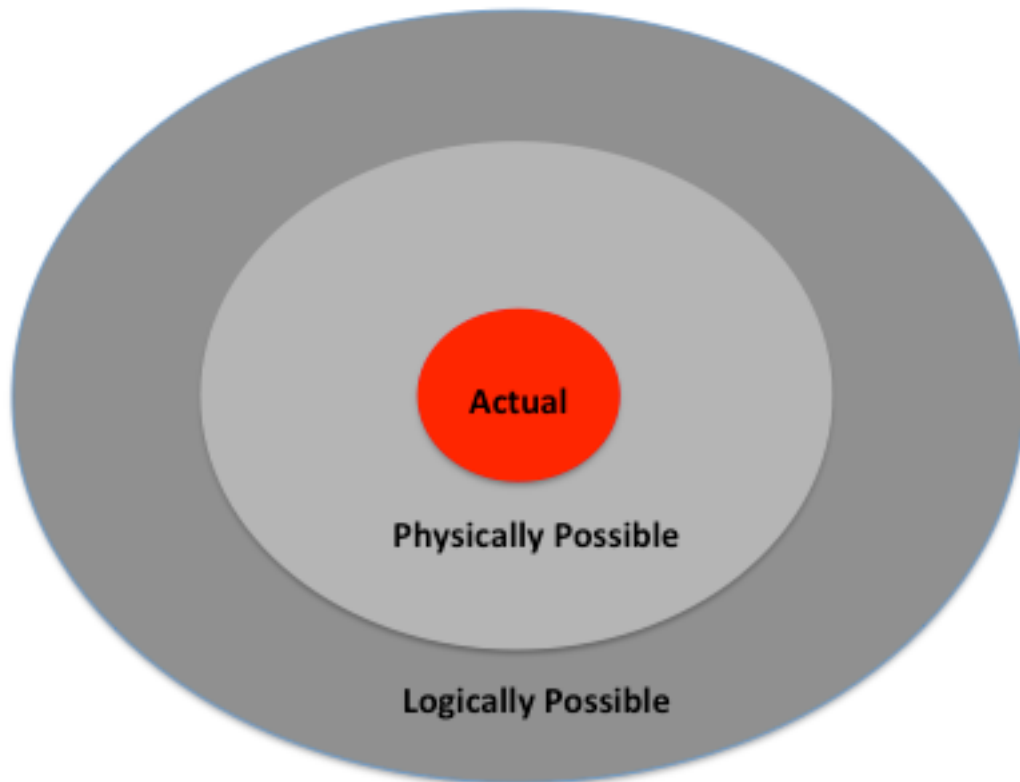
- Propositions are possible *at worlds*
- What's possible at a given world depends upon which worlds that world can 'see' (given the kind of possibility in question)
- When we consider *logical possibility*, we assume we can 'see' *all* possible worlds.

2.2 ACTUALITY, PHYSICAL POSSIBILITY, LOGICAL POSSIBILITY

Logical Possibility

We are interested in logical possibility—so called not because it is in some sense 'more logical' or more correct than other notions of possibility, but because this is the kind of possibility that concerns us in logic—and in math.

There are lots of things that could be or could have been or could come to be— states of affairs that are logically possible. The US could have invaded Iraq in 1991. That’s logically possible. We can’t change the past but things *could have been* different—you could have dropped out of high school, you could now be at the beach asleep. All these states of affairs, however likely or unlikely, including ways things could have been in the past as well as ways things could now be or come to be in the future, are logically possible. Even some truly bizarre states of affairs that aren't even *physically possible* are *logically possible*: the moon could be made out of green cheese and things could go faster than the speed of light.



Not everything that is logically possible, or even physically possible actually happens, of course: you didn't drop out of high school and you aren't now asleep on the beach. Continuing the metaphor of possible worlds, talk about the 'actual world' is a way of indicating that we're describing the way things actually are. So, in this terminology, the actual world is one among many possible worlds. To say that a state of affairs obtains (holds true, is the case) at the actual world is just to say it's the way things really are. Bill Clinton went to law school and was elected president; you went to college and are currently reading this book. Whatever is actual is possible--but there are many things that are logically possible that are not actual.

Given this broad definition of logical possibility you may ask: what, if anything, isn't logically possible? The traditional answer is: whatever is a 'contradiction in terms' and is, therefore,

'inconceivable', is logically impossible. So it is logically *impossible* that there be a round square or a married bachelor. Similarly, *given* your instructor's scheme for curving grades on tests--where the high score, whatever it is, is 100% = A, it is logically impossible that there be a test in this class where no one gets an 'A'. Your instructor *could* have adopted a different grading scheme, but *given* that she adopted this one, the highest grade gets a curved 100%--end of story. Using the possible worlds metaphor we would say that there is no possible world at which there are round squares or married bachelors, or that in a test in this class—*given this grading scheme*—no one gets an 'A'.

Traditionally, as we have said, *conceivability* is the test for logical possibility. To determine whether a state of affair is logically possible, we try to conceive of a possible world in which it holds true—that is, to imagine or describe such a world.⁴

Necessary truths are true at all possible worlds hence there are no possible worlds in which propositions that contradict them are true. Mathematical truths, for example, are generally are held to be necessary truths so that, e.g. $2+2=4$ is true at all possible worlds whereas $2+2=5$ is not true at any possible world. You may think that you can imagine a possible world at which $2 + 2 = 4$ is false. But, as we shall argue, *you can be mistaken about what you are imagining*: the conceivability test for logical possibility, while intuitive, is problematic because you may mistakenly think you're conceiving of something when you aren't!

For now though let's say that a state of affairs is *logically possible* if it is possible in the weakest, most minimal sense—if it is 'conceivable' or alternatively, if it does not involve any 'contradiction'. If something can be imagined, even though it may be physically impossible, it is logically possible. We define the necessity or contingency of propositions in terms of this notion of logical possibility.

2.3 NECESSARY AND CONTINGENT PROPOSITIONS

We can understand the necessity and contingency of propositions at a world in terms of what is true at 'accessible' possible worlds—that is, worlds it can 'see'. Since we're interested in logical possibility we assume that we can 'see' every world from every other world (and from itself) so at this point we can stop worrying about accessibility:

- *P* is *necessary* iff *P* is true at all possible worlds.
- *P* is *possible* iff *P* is true at some⁵ possible world.

We understand necessary truth and falsity, and contingent truth and falsity accordingly

⁴ This, however, can be tricky—as we shall see!

⁵ For the purposes of logic, 'some' just means 'at least one'—could be one, a few, many or all.

Contingent Propositions

'Contingent' just means 'not necessary'. Some propositions are contingently true: as a matter of fact they are true, but they could be false, i.e. it is conceivable or logically possible that they be false. Contingently true propositions are true at the actual world but false at some other possible world. Some examples of contingent truths are:

- (1) San Diego is in California.
- (2) Barak Obama was president of the United States on January 1, 2016
- (3) The earth goes around the sun.
- (4) On earth, things fall at 32 feet per second per second.

The following propositions are contingently false:

- (5) San Diego is in Texas.
- (6) Vladimir Putin was president of the United States on January 1, 2016.
- (7) The sun goes around the earth.
- (8) There is no such thing as gravity: everything just floats around.

Note on our account 'contingent' means 'could be, could become or *could have been* otherwise.' In other words, even though we can't change the past, facts about the past are contingent since they *could have been* otherwise. So (10) is contingent. We can't change the fact that Obama was president even though it *could have been* otherwise.

Note also that because logical possibility is broader than physical possibility, logical necessity is narrower than physical necessity. (11) and (12) are contingent and the same is true for even the most fundamental physical principles. It is merely contingent that nothing goes faster than the speed of light. The laws of nature are only contingently true: it is conceivable that things be otherwise. The earth could be the center of the universe. It isn't. But we could imagine it that way whereas we couldn't imagine, e.g. a round square. It is only contingently false that the earth is the center of the universe. In general, a proposition is contingently false if it is false at the actual world but true at some other possible world, that is, if it is false but *could be, could become or could have been* true. So (5), (6), (7) and (8) are contingently false. Things it could be different from the way they actually are. San Diego—not just another city with the same name—could be in Texas. Putin could have been President of the US on January 1, 2016: we can tell a story about a possible world in which Russia invades, shreds the constitution and installs him as President for Life. The solar system could have been organized differently—until recently in human history people thought it was. And however crazy we can *imagine* a world without gravity.

Necessary Propositions

To say that a proposition is necessarily true is to say that its denial ('negation') is not even logically possible. The following propositions are necessarily true in this sense.

(9) Either San Diego is entirely in California or San Diego is not entirely in California.

(10) Que sera sera. [Whatever will be, will be.]

(11) All bachelors are unmarried.

(12) $2 + 2 = 4$

(9) and (10) are necessarily true insofar as (12) and (13) are necessarily false:

(13) San Diego is both entirely in California and not (entirely) in California.

(14) Some things that will happen will not happen.

These examples are tricky. Consider (9) which says that there are only two kinds of possibilities: states of affairs in which San Diego is entirely in California and states of affairs in which San Diego is not entirely in California. At first blush it looks as if there are *counterexamples* to (9): states of affairs, which would make it false. Are there? Is there any possibility that is excluded by (9)? Read (9) carefully and think about it.

(10) is even trickier. It sounds suspiciously like the thesis of *fatalism*, the doctrine that all events are predetermined and inevitable, so that human action is to no avail and resistance is futile. But consider more carefully what (10) says. It doesn't say that things could not be different from the way they are or that whatever will be is inevitable regardless of what we do: it says that **IF** something is going to be then it's going to be. And that is a very big 'if'! (10) therefore is innocuous: it's just the future tense that throws us! It is, in fact, a sentence of the form 'if P then P', and all such sentences are necessarily true precisely because they don't really tell you anything about the world. If it's raining today, then it's raining today. That's true whether it's raining or not. If it's going to rain tomorrow then it's going to rain tomorrow. That's also true—whatever happens: whether it rains or not!

Necessary truths like this are sometimes called *trivially true* because they don't really provide any information about the way the world is. Suppose, for example, you ask me whether there's going to be a quiz on Thursday. I say, 'If there's going to be a quiz on Thursday, then there's going to be a quiz on Thursday'. (And if there's not going to be a quiz on Thursday, then there's not going to be a quiz on Thursday). Que sera sera! This doesn't tell you anything—in particular, it doesn't tell you whether or not there will be a quiz on Thursday. All sentences of the this form are necessarily true:

If P then P

They are true regardless of the way the world is. This is good news and bad news: good, because sentences like this can be believed with absolute certainty; bad because they don't really tell you anything

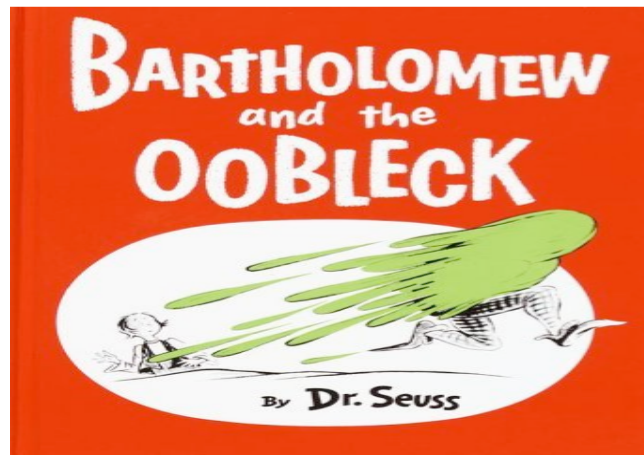
Sentences of the form of (9) are also necessarily true, and also uninformative:

Either P or not-P

So it would be equally uninformative if I told you: 'Either you'll have a quiz on Thursday or you won't'. Both (9) and (10) are *tautologies*, sentences which are necessarily true in virtue of the way in which *sentential connectives*, expressions like 'not,' 'or,' 'and,' and 'if-then', work. We'll study tautologies when we get to formal logic.

(11) is a little different. It is necessarily true but unlike (9) and (10) it is not true in virtue of its *form*, that is, in virtue of the meanings of sentential connectives or other structural words. It is true because of the meanings of content expressions, in particular, the meanings of the words 'bachelor' and 'unmarried'. Nevertheless, like (9) and (10) it doesn't really tell us anything about the world. It doesn't tell us whether this guy, that guy or the other guy is a bachelor, or is unmarried, or what percentage of guys in the population are unmarried, or where the bachelors are—for women (and men) who are interested. Necessary truths don't require the world to be any particular way: their truth doesn't depend on the world—and so they don't tell us anything about the world.

According to orthodoxy, all mathematical truths, including (12) are necessary truths. Again, even though math has application, mathematical propositions are not made true or made false by the way the world is—or by whether or not they are known to be true or false. Consider $2 + 2 = 4$. Take 2 apples and shove them close to 2 other apples and you get 4 apples—so we were told in elementary school. But ' $2 + 2 = 4$ ' would be true even if there were no apples or discrete objects of a kind that could be shoved around or counted. Suppose the world were made entirely of *oobleck*...



Oobleck is this green glop that just squashes together. So, if you shove 2 blobs of oobleck together with 2 more blobs of oobleck you just get ONE BIG BLOB of oobleck. Nevertheless, in the oobleck world, $2 + 2 = 4$ is still true—even though arithmetic doesn't have much use there.

The moral: because necessary truths are true at all possible worlds they don't tell us anything about *our* world—the way things actually are. By the same token, since necessary falsehoods are false at all possible worlds they don't tell us anything about our world either!

A proposition is necessarily false if it is inconceivable that it be true, that is, if it involves an absurdity or contradiction. San Diego could entirely be in California or not entirely in, that is, it could be partly in or entirely out. That exhausts the cases. While some things are going to happen and other things are not going to happen, *given* that something that *is* going to happen is not possible that it is also *not* going to happen. Some men are bachelors and some men are not bachelors. And bachelors can, and often do, eventually get married. But so long as a man is a bachelor he is unmarried. Finally, as for truths of pure mathematics, they are true regardless of what the world is like. They are true at oobleck worlds where arithmetic is useless. And they are true at worlds where there is no one around to do math. $2+2=4$ didn't suddenly become true when people learned to count. It is not, in some sense, merely 'subjective' or 'mental'.

This is a hard saying because it looks like necessary truths are, in sense, linguistic: (9) through (12) seem to be true in virtue of the meanings of words, including symbols like '2', '4', '+' and '='. We will address this concern by considering, and responding to the following...

Puzzle About Logical Possibility: How can there be necessary truths?

On this account, how can anything be logically impossible?!? We can always describe a "world" in which a given state of affairs obtains, if we're clever. Take "all bachelors are unmarried": I can describe a world where "bachelor" means "male under 30" and such a world is one in which there are married bachelors, right? Similarly " $2+2=4$ " and " $2+2=5$ ": it's just a matter of how you define the symbols, right? It's like your grading scheme: you could have set the curve differently so that no one got an "A." So, with logic, all things are possible... *What's wrong with this picture?*

For now, however, let us consider some other possibilities...if, indeed, they are possibilities.

3 THE POSSIBILITY OF THE PARANORMAL: PRECOGNITION

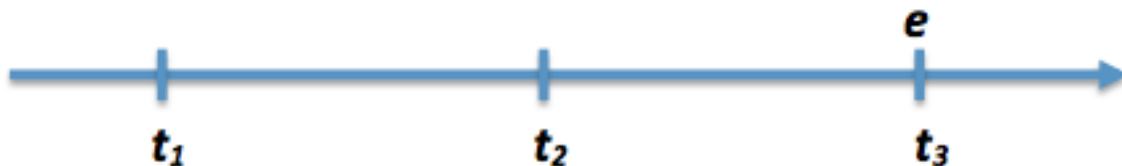
Is ESP (extra sensory perception) possible? It depends on what you mean by 'possible'—and what you mean by ESP. Some kinds of paranormal phenomena are logically possible—as logically possible as flying pigs, things going faster than the speed of light and Serra Hall spontaneously turning into a huge mass of peanut butter. These include telepathy (mind-to-mind communication), clairvoyance (the awareness of events at a distance) and psychokinesis (moving physical objects by mind-power alone). Other kinds of psychic phenomena are more problematic.

Is precognition ('seeing into the future') logically possible? That question is philosophically interesting, which is to say, controversial. The easier question is whether it actually occurs...and there is no reason to believe that it does. Every year psychics make predictions about the year to come, and every year most of them don't come true. Here, for example, is a list of failed psychic predictions for 2014 look here: <http://www.relativelyinteresting.com/2014-failed-forgotten-psychic-predictions/>⁶ But of course not everything possible is actual, and even if precognition doesn't actually occur that doesn't settle the question of whether it is possible. 'Seeing into the future' assumes first of all that there's a future to see into and, secondly, that future events can be, in some sense, 'perceived' by psychics. Both of these assumptions are problematic.

Let us consider the second problem first. Even assuming that the future is, somehow, 'out there' it's hard to understand how anyone could 'see into' it because that would seem to mean that future events could *cause* current events. Think of what ordinary seeing is: light reflected from the surface of objects hits our retinas, travels down our optic nerves, stimulates our visual cortex and causes us to have visual experiences. So, in general, we come to know facts about the world because events and other states of the world *cause* us to have certain experiences. Normally however, causation goes just one way: from earlier to later. If we want to claim that psychics look into the future we are going to have to revise that assumption. We will have to hold that later events cause earlier events so that events in the future cause the psychic to have the experiences on the basis of which she makes her predictions.

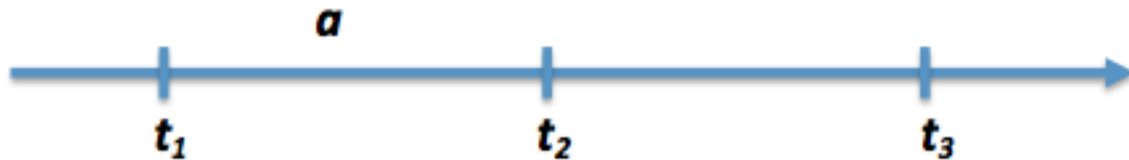
Even leaving aside the worry that 'seeing into the future' involves backwards causation, assuming that there is a future 'out there' to be seen into is worrying. Intuitively, the future is 'open' so that we can, through our actions, determine how will go. If however the future is, as it were, *there* to be seen into, it seems that there's no way that do that. But, is the following logically possible:

Suppose a psychic looks into the future and sees that a certain event, *e*, will occur at a time a time *t*. Now *if* I have free will then I could do some action *a*, which would prevent *e* from occurring at *t*. What this means is that at times before I did *a*, event *e* was going to occur whereas after I did *a*, event *e* was not going to occur. Let *t*₁ be some time before I do an action, *a*, and let *t*₂ be a time after I do *a*. Suppose tht at *t*₁ the psychic looked into the future and saw *e* coming, so that this is the way things looked when you consulted the psychic: *e* was out there in the future waiting for you.



⁶ Failed predictions for 2015 aren't out yet...but stay tuned!

After the consultation however you take action to forestall e which (since you have free will) is successful so at t_2 , after doing a , it is no longer the case that e will occur. At t_2 the picture looks like this: you did action a and now e is *not* going to happen.



There is something peculiar about this story. The timelines are supposed to represent the way in which the world is *timelessly*. However it looks as if the way in which the world *timelessly* is, is different *at different times*! That is at least peculiar, if not incoherent: if we're speaking *timelessly* we are we're thinking of time as analogous to space viewed from above so to speak, as on a map, rather than from the point of view of someone traveling through space. From the point of view of someone traveling from San Diego to the Salton Sea, for example the country 'changes': from a semi-arid, coastal plane, to mountains, high desert and finally a salt plane below sea level. But looked at from above, there is no 'change'—just difference: San Diego is *always* coastal, the mountains are *always* high and the Salton Sea is *always* below sea level.

When we view history in this way—timelessly—nothing changes either: it is *timelessly* true that George Washington was the first US president, *timelessly* true that Obama is president now, in 2016, and *timelessly true that whomever is elected next will be president in 2017*. We don't of course *know* who that will be, but there are lots of truths that we don't know. Viewed timelessly, that fact is out there in the future waiting for us to find out about it.

But if the timeless perspective is correct then it looks like the future is 'closed'— that is, that facts are 'out there' and there's nothing we can do about them. That is, we can't do actions that will make a difference to the way the future goes. It looks like we don't have free will in any interesting sense unless the future is 'open'. But if the future is open then there are no facts out there waiting to be discovered—or now available for precognition by psychics. So it looks like the psychic case above is if the psychic really can look into the future and see some future event then there's nothing we can do now to avoid it. This makes going to psychics pointless: if they really can see into the future then there's no way we can change it, so there's no point in consulting them; if they can't see into the future they're fakes.

More interestingly, quite apart from questions about the supposed abilities of psychics, this poses serious philosophical questions about our intuitive understanding of ourselves as free agents who, through our actions, are able to make a difference in the way things to go.

4 PRECOGNITION AND THE OPEN FUTURE (OPTIONAL)

Is the future 'open'? That is, is it possible that things in the future go in different ways? Here is an argument that should make us worry... First we make some mildly controversial assumptions as premises:

1. Propositions about the future have *truth value*—that is, truth-or-falsity: some propositions about the future are true; others are false.

Right now (4:34 pm January 18, 2016) it is true that in 24 hours time it will be Tuesday and that 10 minutes from now the coffee will be brewed and I'll have a cup. Of course there is a lot about the future we don't *know* and our predictions are often wrong. My Mr. Coffee could blow up. But there are also a lot of facts about the present and past about which we're ignorant or mistaken—the future isn't special in that regard. *Knowing* that something is so is not the same thing as it's *being* so: there are a lot truths that we don't know and maybe even some that we *can't* know. *Truth value*, that is, truth-or-falsity is not the same thing as knowledge: 'It will rain tomorrow' is either true or false—even if no one now knows which it is.

2. Any tensed sentence can be translated into a tenseless sentence that says the same thing.

So, e.g. when I, at 4:34 pm, uttered the tensed sentence, 'I *will* have a cup of coffee 10 minutes from now', I'm saying that I HAVE coffee at 4:44 pm, Monday, January 18, 2016. The 'HAVE' in this sentence is tenseless, rather than present tensed. In tenseless sentences like this, times and dates replace grammatical tense.

3. Tenseless sentences have the same truth value at all times, i.e. they are either always true or always false.

In replacing tense with times and dates, we make sentences timeless in the sense that they say the same thing at all times. Consider the following sentences:

(17) Today is the first day of Spring Break 2016 at USD!

(18) The first day of Spring Break at USD is March 21, 2016 .

Right now January 18, (17) is false. It will be false until March 21, when it will go true for 24 happy hours and then sink into falsity again—forever! (18) however, if true at all, is *always* true. It was true even before whoever in the administration makes decisions about the academic calendar set that date for the start of Spring Break and it will be true until the end of the world.

The reason for this difference is that (17) is *context-dependent*. What context-dependent sentences say depends upon features of the context in which they're said, that is where, when, by whom or in what circumstances they're uttered. What (17) says depends on *when* it's said. Right now, (17) says that Spring Break starts on January 18, 2016. That's false .Tomorrow, (17) will say

that Spring Break starts on January 19, 2016, which is also false. I think you get the picture. (18) however is not context-dependent. It says the same thing whenever anyone says it, viz. that USD Spring Break 2016 starts on March 21. It always reports that same fact.

The truth value of (17) changes from time to time because (17) says different things at different times. But (18) says the same thing at all times so it seems reasonable to conclude that its truth value doesn't change from one time to another.

4 Nothing we do can make any difference to the way the future goes.

Now let's get back to the psychic. At t_1 she predicted e . Maybe she said 'e will occur' or maybe she said something else to that effect: whatever she said, in predicting e she was claiming that the tenseless sentence, 'e occurs at t_3 ' was true. Was she right? If she was then that sentence was a timelessly true sentence: true at all times. Regardless of what anyone does, it stays true. But then my doing a subsequently can't prevent e from occurring! To prevent it from occurring would be to make the psychic's prediction false but that is not doable since 'e occurs at t_3 ' can't change its truth value. Was she wrong? Then 'e occurs at t_3 ' was false and, since it is a timeless sentence, was false at all times: a timeless sentence can't change truth value. So whichever way it is—whether 'e occurs at t_3 ' is true or false—it couldn't change its truth value. Whatever anyone did in response to the psychic's prediction couldn't make any difference! There's no point in going to psychics: if they can *really* see into the future, then nothing we do can make any difference to how the future goes. More seriously, if there are timeless facts about the future, if it is true now that certain things will happen (whether we know it or not) then we can no more 'change the future' than we can change the past!

Even if we drop the worry about psychics seeing into the future, the idea that there is a future 'out there', so to speak, is worrying in and of itself—so worrying that some philosophers have suggested that future tense propositions about individuals don't have truth value. But, we won't go there...

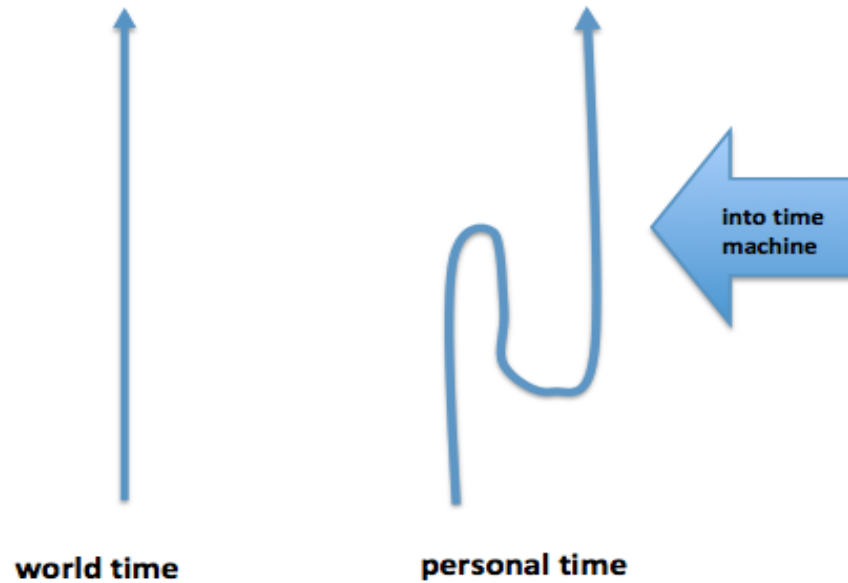
5 TIME TRAVEL

Although there are serious problems with the assumption that there is a future, which we, or at least gifted individuals amongst us, can see into, the past seems less problematic: intuitively it's there (somewhere), fixed, and can't be monkeyed with. And we can certainly 'see into' the past: we do it all the time. But can we travel into the past?

Like precognition, time travel is logically problematic and, therefore, philosophically interesting. There is no evidence that time occurs. In 2005, for example, students at MIT organized a Time Travelers Convention (see <http://web.mit.edu/adorai/timetraveler/>) for tourists from the future. The convention was a 'fun event' contrived to attract time travelers. But none showed up. We can still ask, however, whether time travel 'into the past' is logically possible. And, of course that depends on what we mean by 'time travel'.

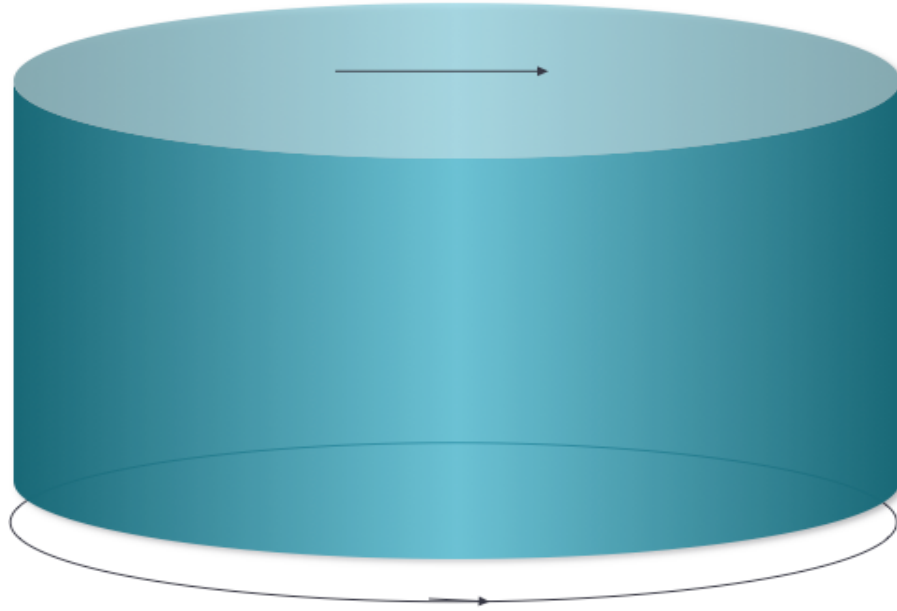
We can distinguish two kinds of time travel: Wellsian and Gödelian time travel.

Wellsian time travel, so called because it was popularized in H. G. Wells' science fiction novella *The Time Machine* is the familiar variety that figures in such classics as the *Back to the Future* series. In a case of Wellsian time travel an individual 'goes back in time' so that for a stretch of world-time his personal-time runs backwards.



Is this logically possible, or do contradictions lurk?

Then there is Gödelian time travel, named after the mathematician Kurt Gödel who argued that given Einstein's theory of relativity, there could be 'closed time-like curves' in space-time. Gödelian time-travelers don't go backwards in world-time. Rather they exploit the shape of space-time to get back to where they started:



Imagine that space is shaped like a drum, so that at the center time goes left to right on the diagram but at the 'outside' goes counterclockwise around the 'edge'. (Of course, there is no edge because this diagram represents the whole universe—finite, but unbounded!). Imagine a very long-lived time traveler in a spaceship with an enormous amount of fuel beginning at the center of the universe and traveling to the right and 'outward'. As he gets further out he loops around, never going backward in world-time, going counterclockwise *with* the flow of world-time and then, after going around, heads back to the center where he completes the loop—and meets his earlier self!

What should we say about time travel? Let us just say that as far as we know, like precognition, it doesn't happen, and that remains controversial whether it's logically possible.⁷

6 TELEPATHY AND CLAIRVOYANCE

Leaving aside precognition, there are other claims about the paranormal that don't pose interesting philosophical puzzles. Telepathy, clairvoyance and psychokinesis are logically possible. But is there any evidence that such phenomena actually occur?

6.1 THE DUKE UNIVERSITY ESP EXPERIMENTS⁸

In 1911, Stanford University became the first academic institution in the United States to study extrasensory perception (ESP) and psychokinesis (PK) in a laboratory setting. The effort was headed by psychologist John Edgar Hoover. In 1930, Duke University became the second major

⁷ for more about time travel, see David Lewis, 'the Paradoxes of Time travel at <http://www.csus.edu/indiv/m/merlinos/paradoxes%20of%20time%20travel.pdf>

⁸ http://en.wikipedia.org/wiki/Parapsychology#Criticism_and_controversy

U.S. academic institution to engage in the critical study of ESP and psychokinesis in the laboratory. Under the guidance of psychologist William McDougall, and with the help of others in the department—including psychologists Karl Zener, Joseph B. Rhine, and Louisa E. Rhine...

The publication of J.B. Rhine's book, *New Frontiers of the Mind* (1937) brought the laboratory's findings to the general public. In his book, Rhine popularized the word "parapsychology," which psychologist Max Dessoir had coined over 40 years earlier, to describe the research conducted at Duke. Rhine also founded an autonomous Parapsychology Laboratory within Duke and started the *Journal of Parapsychology*, which he co-edited with McDougall.

Rhine, along with associate Karl Zener, had developed a statistical system of testing for ESP that involved subjects guessing what symbol, out of five possible symbols, would appear when going through a special deck of cards designed for this purpose.



A percentage of correct guesses (or hits) significantly above 20% was perceived as higher than chance and indicative of psychic ability. Rhine stated in his first book, *Extra-Sensory Perception* (1934), that after 90,000 trials, he felt ESP is 'an actual and demonstrable occurrence'...

The administration of Duke grew less sympathetic to parapsychology, and after Rhine's retirement in 1965 parapsychological links with the university were broken...

Since the 1980s, contemporary parapsychological research has waned considerably in the United States...Some effects thought to be paranormal, for example the effects of Kirlian photography (thought by some to represent a human aura), disappeared under more stringent controls, leaving those avenues of research at dead- ends.

6.2 CRITICISMS OF RHINE'S WORK

Psychologists Leonard Zusne and Warren Jones suggest that Rhine's early research could be fully explained in terms of ordinary forms of information transfer:

Chance was clearly not producing Rhine's results. It was opportunities to establish the identity of the cards by sensory means. These were so numerous and so readily available that much of Rhine's work during the 1930's may be safely ignored. Testing often occurred in a face-to-face situation, with minimal screening between the agent and the percipient or none at all. When an agent sits across the table from the percipient, the latter can see the backs of the cards. At one time, the ESP cards had been printed with such a heavy pressure that the symbols became embossed in the card material and could be read from the back. In 1938 it was discovered that the symbols could also be seen through the cards, which, of course, allows room for fingertip reading of the backs of the cards and, if they are marked, of their sides.

The instructions that accompany the ESP cards, which were made available to the public in 1937, indicate that an 18 x 24 inch piece of plywood would be sufficient for screening purposes. It is decidedly not. A small screen still allows the percipient to see the faces of the cards if the agent wears glasses, and even if the agent does not, because the card faces are also reflected from the agent's corneas. Changes in facial expression give away clues that are not concealed by small screens. Larger screens still allow the percipient to hear the agent's voice. If the agent also serves as the recorder, which was routine in Rhine's experiments, voice inflections are as useful source of information as are facial expressions. Furthermore, the sound of the pen or pencil wielded by the agent as he or she records the calls can be also utilized by a person who is skilled at it or learns the skill when tested over a sufficiently large number of trials. Involuntary whispering on the part of the recording absent cannot be excluded as an additional source of information. When the distance between the percipient and the cards was increased, scores dropped.⁹

6.3 WHAT SHOULD WE CONCLUDE?

ESP is incompatible with the principles of contemporary orthodox physics. However that alone should not lead us to dismiss it without further investigation. We can always be mistaken! It could be that contemporary orthodox physics has got it wrong. Science, after all, progresses and even the most entrenched theories have collapsed in light of new data.

If however we want to challenge orthodox science we had better have some very good evidence that it has gotten something wrong. And so far there is no serious evidence for the occurrence of telepathy, clairvoyance, precognition or other psychic phenomena.¹⁰

⁹ Leonard Zusne and Warren Jones, *Anomalistic Psychology* (Hillsdale, NJ: Erlbaum, 1982), pp. 374-75 21

¹⁰ Want to read more? For further discussion of scientific investigation of claims of the paranormal read Richard Wiseman's *Skeptical Inquirer* article '[Heads I Win, Tails You Lose: How Parapsychologists Nullify Null Results](#)' at *Skeptical Inquirer* Volume 34.1, January / February 2010.