what we should do is to start back about
the real possibility of time travel
because I think it's important for
people to realize that it's not
something that just I came up with it's
actually something that's based on solid
physics and in fact time travel to the
future is not only uh solid physics it's
something that we've been able to do
people don't realize a time travel of
the future has happened and we've
demonstrated it's time travel to the
past that we haven't done experimentally
although theoretically we can talk about
it and all of this notion of the serious
possibilities of time travel are based
on Einstein's theories of Relativity so
I should start off with that and what we
know about that and then go into what my
contribution has been uh Einstein back
in 2005 came up with a theory about how
light behaves with speed okay what year
was it uh 2005 okay okay I'm
sorry back up couple decades earlier
right I'm into the 21st century right
right right I me that uh back in uh 1905
right Einstein came up with the basic
theory about how uh speed is affected
right how speed affects uh our Behavior
with space and time okay and um that is
exactly the root of the possibility of
time travel into the future uh now
normally whenever someone for instance
throws an object at you okay it depends
on if you're standing still or if you're
running towards them I have a baseball
for example and I'm throwing the ball at
you and I'm standing still as if coming
at you at a certain speed if I'm running
towards you and I throw the ball at you
it's going to be coming at you a lot
faster right in fact that's what a
pitcher does okay in order to um on the
mound now let's suppose we're looking at
light uh let's say a flash light thing
is is that light even though it looks

like it's continuous it's made up of
little particles of light called photons
these photons are traveling at 186,000 m
per second at you you can think of them
as being like balls of light now suppose
that I'm shining the flashlight at you
these balls of light will be coming at
you at 186 uh th000 miles per second but
now if I'm running toward you then just
like the baseball you expect these balls
of light to be coming at you faster mhm
okay well when the experiment was done
and it wasn't done with the flashlight
it was an experiment that was done in uh
was
1887 uh by a two physicist Michaelson
and Morley what they found was is that
if you were shining and this I'm going
to be phrasing it in terms of the uh
flashlight but if you were shining the
flashlight at someone and you were
standing still the speed of light was
one speed it would expect it to change
if the you know you know uh beam of
light was moving towards you turns out
that the speed was not of the light was
not affected okay at all it was exactly
the same speed it would be as though I
was telling you that that baseball was
coming at you at exactly the same speed
whether I'm standing still or I'm moving
towards you right what's going on here
all right so the experiment as I said
was done in the 19th century and it was
a puzzle and it was Einstein who
resolved the puzzle what Einstein said
is that the only way that the speed of
light should not
change no matter how fast the source of
light is moving towards you if something
else has to change and he said that
something is time time has to slow down
in order to keep the speed of light from
changing so what he said is is that and
now think about that again once again
what he said is that the only way the

speed of light can stay the same is
something else does have to change and
that change happens with time time has
to slow
down in order for the speed of light not
to change okay now you might say well
has that been shown that's the core of
his theory it has been shown
experimentally the in fact one of the
things and this is once again
interesting uh it's been shown
experimentally it many many things uh
for example we have uh a device that's
called a particle accelerator right it's
at the uh Switzerland right the large
it's the uh CERN yeah CERN exactly the
Large Hadron Collider and what they do
is they take subatomic particles the
subatomic particles um can travel at all
kinds of speeds okay now what happens is
is that some of these particles they
disintegrate after a very very short
period of time
what they do is they find out that if
they speed up these particles in these
accelerators they can get these
particles to actually live longer than
they normally would what does that mean
that means that their internal clock
think of these particles having a
Lifetime right and their normal lifetime
is you know just microseconds okay all
right fractions of a second when we
speed it up their internal clock
actually slows down
so that they actually live
longer than they normally would so so
moving through space at any speed
automatically slows times time down
relative to how fast you're going that's
right or does I thought I I was under
the impression that you had to be going
the speed of light no no any speed when
you're in your car when you're on a Jet
Plane the speed is as a matter of fact
this was shown with ordinary passenger

Jets okay I was you know I've used the example the large hyron coll theic clock right that's right but this experiment was done with ordinary passenger Jets traveling at the speed of sound okay what they did was they took uh this at the Naval Observatory and people aren't aware of this was is back in the 1970s MH what they did was to take atomic clocks which are the most precise timekeeping mechanism we have they put one of the atomic clocks on order on a board an ordinary passenger jet they put the other atomic clock stationary at the observatory Naval Observatory they flew the passenger jet around the world and bought it back what they found was is that when they bought it back the passenger jet the clock on the passenger jet had slowed down compared to the clock that was at rest at the Naval Observatory this happened the passenger J was only going at the speed of sound okay so this shows that at any speed time will slow down but the faster we go the more time will slow down so it has nothing to do with having to travel at the speed of light this means that if we have rockets that can go close to the speed of light then it would be a dtic effect for example let's suppose that an astronaut uh has a family here on Earth right okay and suppose that we send them out to on a passenger jet or sorry on a a rocket that's going close to the speed of light when The Rock if let's suppose that for the astronaut it only appears that it took them um 5 years to go out and coming back from their standpoint okay but their clock has been slowing down right decades could be passing here on the earth they could come back and find out that if they had children their children might have grown up and had children they could come back and find out that they are younger than their

grandchildren and that's that's one of the um the conundrums to doing this to sending
explores on a rocket out into the deep out into deep space is that like if they're traveling close to the speed of light and they're on this they're on this rocket for years time on Earth is going to be moving so much faster we're going to be developing more technology more rapidly and like just say 20 years or 10 years into their mission he could have a rocket drive right past him with guys that just left with a belly full of breakfast that morning and because they advanced in technology so much so it would be like such a waste of time if technology is just advancing that much faster on Earth to just pass them up
yeah well Danny that's a good point in fact there's a movie that got it right on that it was Interstellar right yeah
okay because that's precisely what can happen is the fact that the people who left and were traveling at uh very high rates of speed to get across space it turns out that for them even though um just a few years are passing on Earth decades were passing right okay and that's but the interesting point is is that it's real
[Music]