JEAN

Am I clear?

(Pause)

Good. With this we can move on. I'd like to touch on what we will cover next lecture just for you to think about it in the meantime. As we all know, what we are trying to do with quantum mechanics is to examine and describe the behavior of matter and light in the smallest of details; on the atomic scale. Try imagining the smallest quantity you could possibly discern… now go even smaller than that… and one step smaller again. We are delving into the world on a scale so minuscule that physics here behave like nothing you have ever experienced.

Projector screen shows "Heisenberg"

You may recognize this name from somewhere. Maybe differently from your those sitting beside you. Now, who associates this name with... purity? The color blue? Drugs? What about the rest of you? To whom does this name bring about the thoughts of uncertainty? Particles? Velocity and quantum mechanics? Well... that's why we're here today: Werner Heisenberg, german physicist who in 1927 coined this "uncertainty principle"; the theory which describes how description, measurement in itself can be fallible.

Projector screen shows uncertainty principle equation

Here we have the equation, h bar here denoting the reduced Planck's Constant- but let's dig into the mathematics of it in the next lecture. What Heisenberg discovered was that the very act of attempting to observe an electron which may have been practically at rest matter changes the result of what is being observed in relation to the accuracy which you allow the result to deviate from. Why? The simple answer is that at least one light quantum of the X-ray must have passed the microscope and must first have been deflected by the electron. Therefore, the electron has been pushed by the light quantum, changing its momentum and its velocity. We can prove that this movement is just enough to guarantee the validity of the uncertainty relations. But we are not here for simple answers are we? We want to observe deeper, understand more. So we ask further: "How does it work? What is the machinery behind the law?" Will I be answering these questions for you? What I can tell you is that I can explain as much as I possibly can and as much as you'd like to hear… but as of now in the world of quantum mechanics there is no deeper representation or explanation of the situation. We will by the end of this module, hit the bottom of the barrel

of answers and explanations and then see that the barrel goes deeper to uncharted territory that we cannot even step into… Crawl into it? Maybe. I do know, however that the examination of the impossible is exactly the reason why we are all here. We will have to embark on this journey in quite an abstract and imaginative manner with little connection to our direct experience in this large physical world. Some would ask then: "Why bother? It's all in the imagined realm of abstraction" since we're just guessing… taking stabs in the dark. Heisenberg proposed the principle in order to validate quantum mechanics. He observed that if we were able to measure the momentum and the position of an electron with greater accuracy, maybe even pin point, the world of quantum mechanics would collapse. So actually we created uncertainty in order to maintain order within the mechanics of it; perilous but essential to the existence of quanta matter. Please, keep this lingering in the back of your minds till we meet again. Thank you, do stay behind if you have any questions you may have for me.

Excerpt of Scene 4.Bernini Swag

JEAN

I... I don't... understand... art.

ALICE

Sometimes you don't have to understand. You just have to feel it.

JEAN

But that's exactly the thing- I don't get it. I don't feel it.

ALICE

There's a piece- this artwork that I saw the last time I was here that I thought you would like. What the artist tried to do was mash together ideas of science and culture into one thing in order to see what came out of it. It's kind of like us I guess. We're two totally different things which some would say are totally far apart but somehow... when I saw the piece I saw how within it... in the tiny gaps in between the pieces that held it together... I could see how... at the very core... everything was sown into each other... interweaving... connecting, affecting, constructing, informing, forming this thought in my mind... that we both are actually looking at the same thing... something very impossible to see. But you know for sure that it's there so we keep breaking things down further and further into smaller and smaller details to try and observe something to the smallest level to try and make sense of the bigger things in the universe. We try to

separate the smallest denominators and observe the space inbetween. To make liminal space just another variable we can work with, command, manipulate and control.

JEAN
That sounds exactly what I try to do.

Excerpt of Scene 6.Discourse of Course

JEAN
Could I ask you something...? Why linguistics? You could have easily become a... medical practitioner?

ALICE
Why not linguistics? Where would we be without language? Why quantum mechanics? The level of scientific function which you work with is out of reach to most. It takes years of study to comprehend the benefits which quantum mechanics bring us. Higgs Boson; what does that mean to you? Alot I'm sure, but what does it mean to me? Alot less. To the layman? Probably nothing at all. There are people who hear 'particle collider', 'atom smashing' and think that the next big bang is upon us. The apocalypse, is that what you wish to bring upon us? What's the point of understanding how and why electrons move? We have lived through centuries oblivious to the concept of their existence; surely we can ignore quantum mechanics and focus on biological endeavors... medical practice? Just because you don't understand or see something, don't discount it's reality. It's existence.

JEAN
We don't really know what we're looking for with the Higgs Boson. We're kind of making it up as we go. It's uncharted territory. We're at the beginning of the fog… we can't see beyond it but we're sure something is there. Percy Spencer was pioneering radar and wireless technology when he chanced upon inventing the microwavable oven. These are the kind of things I remind myself about whenever I feel... stuck. We just have to keep moving on; no matter what it is. We have to leave a place to get to another.

ALICE
(V.O)
Understanding is merely the comprehension of other understandings so still... we have no idea what we are talking about, neither you nor i.

JEAN
(V.O)
One thing changes everything but nothing is ever just one thing, it is a collection of many things consolidated into an idea of what we think it is.

everything is everything/one thing is everything. So right now you are working to identify, translate and codify all the languages in the world to create a sort of classification of each and also to be able to create bridges between languages, cultures to facilitate exchange... communication so that we can all understand each other.

ALICE
Hmm... yes...?

JEAN
Have you ever thought of... you know... one day when the entire human race speaks only one language so that we all understand each other at last. So that we're connected as a species, as a race.

ALICE
We already do.

JEAN
Really?

ALICE
It's the language of love. I'm kidding. Ok not really. But... I know what you mean... That's... Why would you want to do that?

JEAN
Isn't it better? We understand each other better, no miscommunication.

ALICE
Even people who speak the same language miscommunicate all the time.

JEAN
Well then we should create a language which can never be misunderstood!

Excerpt of Scene 7.Xibipiio

ALICE
Something about... It's pretty hard to say it in english. There's just so much which can be quite difficult to encapsulate within a word; an english word. Which is why I enjoy learning new languages; it's these combinations of sounds to create something which is usually incomprehensible and meaningless to us english speakers but it's codified by another culture to express something that might just be influential to the very essence of what that the culture is. Like… xibipiio.

JEAN

Xibipiio?

ALICE

There is this tribe in the Amazon… known to us as the Pinaha. They are a brilliant example showing us how language is really a construct built in tandem with culture; which is also a construct. They live in remote areas, far from any so-called civilization in these small clusters where really they are completely ignorant to the rest of the world around them so instead they have this important value which is what we call the immediacy of experience. Because they don't know and I would guess not care about what really lies beyond the horizon… what would be important then is what's happening here and now… not what's in the distant future or in the deep past. The focus… concept of now. The Pinaha have this concept called Xibipiio. These people don't speak Portuguese so it really is not a derivative of any word which we already know of… it is literally to us just a string of syllables said into this… word. So how do we find out… or translate the concept and meaning of Xibipiio when there is no language in common? Daniel Everett, a linguistic researcher went there to experience on his own their language and culture in order to transcribe their concepts like Xibipiio to us. So he recalls a fellow walked into the jungle and they said he xibipiio left, and then somebody else came out of the jungle then they said he xibipiio arrived, well maybe it means that he just left he just arrived. Then he saw somebody go around the bend in a canoe they said he xibipiio left, came back, he xibipiio left. Planes would xibipiio. Then one night his flashlights batteries were dead, and he had this match lit and it was flickering and they said that the match was xibipiioing. They used it as a verb and he couldn't figure out what on earth would this mean. Well it was then concluded to mean to go in and out of the boundaries of experience; if you want to use a technical term you could say it refers to experiential liminality. But it simple means to go in and out experience, this is so important to them, it is the excitement of seeing something go in and out of experience and the pinaha have codified that and made it a very important part of their language and in their culture.