

## ***Introduction***

The basic concept upon which this original play is based is a natural progression of the period during which teachers and their pupils worked with the unit: Elementary Particles.

A lot of effort is being put into making pupils understand that the scientific work with elementary particles is not purely theoretical. On the contrary, it is not indistinguishable from medical practices mainly aimed to benefit people and society in general. Such an example is the Positron Emission Tomographer (P.E.T.).

The basic «cloud» concept of a travelling cloud in a chamber, in the same way that clouds in the sky do, is basically symbolic. It symbolizes a kind of journey into the knowledge and experience that pupils will acquire through their study of an experiment that in 1927 and in 1936 earned itself a Nobel prize in Physics and shed more light on what cosmic radiation suffusing our planet is all about. The theoretical template upon which our experiment is embedded is ready to reach schools, thus offering new knowledge and examples to draw on to science.

Ours is an approach characterized by humor, imagination, the conjunction of certain manifestations of science and art and tolerance of difference.

## **A strange cloud of knowledge ...travelling!**

### **Prologue**

#### ***Narrators (puppets)***

***Narrator 1:*** - Clouds, as is so often the case, travel non-stop through the skies. They are pushed forward and given various shapes by wind currents with our imagination adding the finishing touches to the painting with the aid of its magic brush. And so, depending on our mood, we can spot huge jungle animals, like elephants, lions or even lanky giraffes and zebras in their striped pajamas.

***Narrator 2:*** At other times, we can spot geometric shapes and all kinds of lines, white feathers or ponytails and other well-known figures of queens and princes, even dragons fresh out of legends and fairy-tales. But do let's try to get into their world and get to know a bit more about their lives and their adventures.

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***Cloud 1:*** - Enough! I'm so very tired today! I've been on the run non-stop. I'm so sweaty that I'll start drizzling.

***Cloud 2:*** - And I'm so overweight that my extra weight'll soon go off pouring down on people!

***Cloud 3:*** - I see what you mean. And I'll start sneezing down hail if I get a bit more cold wind blown in my direction! You see, we are the middle and the low clouds. The senior fellows, Cirrus, are luckier!

***Cloud 1:*** - On the other hand, do you think that Cumulus clouds are better? One day are laid back on their fluffy cotton mattress; at night make their way to their resting place together with their friends, the warmer currents.

***Cloud 2:*** - That's right dear colleague. We are the ones that have to fill the lakes and the rivers with water. We are the ones that care about watering the farmer's fields.

***Cloud 3:*** - Hold on a mom. Can you see what I see?

***Cloud 1:*** - What is that weird cloud coming our way?

***Cloud 2:*** - I don't think it belongs with us, as it's closed in a plastic box. But why?

***Cloud 3:*** - Do you think it's what it travels in? Maybe so, but... there are no wheels under it, though... Looks like a mystery to me!

**Cloud 1:** - Oh, get out of here...you're making it out to sound like it is a spaceship...

**Cloud 2:** - Whatever do you mean? That aliens are coming down? You're scaring the wits out of me!

**Cloud 3:** - Well, we could ask to identify himself as soon as it is a bit closer to us....

**Cloud 1:** - Hey, mate! What's your name? Where do you come from? Can you speak?

**Cloud 2:** - Do you come in peace? Are you bringing along a present for us?

### ***Scottish music background (Scotland the Brave)***

**Strange Cloud:** - Hello, how are you?

**Cloud 1:** - You 're not a web cloud, fraught with data, are you? Or a tag-cloud, full of tags?

**Cloud 2:** - Colleague, Cloud1, how come you 're so well-versed in such stuff? I'm amazed! I wouldn't hand it to you...Things are going faster than I thought they would...

**Strange Cloud:** - Hello, I've lived in Great Britain, in Scotland in particular, for many, many years. That's where I come from.

**Cloud 3:** - Right, and what's the role of the box inside which you're closed ? You look like babies in an incubator a short while before they are taken home from the maternity ward.

**Cloud 2:** - Look at him! A pediatrician par excellence!

**Cloud 3:** - Come on, come on! No more joking around...Let's welcome the strange traveler!

**Clouds (all together):** - Welcome our distant friend. What's the news you're bringing?

**Strange Cloud:** - You're right in wondering. I'm not a cloud like you. I'm a bit different. To be more precise, different enough...I'm an artificial cloud. My story goes a long way back. Back to the beginnings of the 20th century, that is a hundred years ago.

### ***Scottish music background (Scotland the Brave)***

In 1911, the English Physicist Charles Wilson was studying various visual phenomena created by the weather in the Scottish mountains, so-called Highlands (1,345 meters), definitely not as high as the Alps, though.

Well, the humidity of the area itself in conjunction with the low temperatures there made Wilson observe some curious changes within the nebula. Some small and quick flashes of light like tiny white fireworks going off.

That certainly made him suspicious of there being what we know as cosmic radiation.

**Cloud 1:** - What exactly does it mean?

**Strange Cloud:** - It results from the rays of an exploded Super Nova (photo) that is of a very old star. Such rays travel through space for thousands of years, covering distances really inconceivable for our human mind, and some of those rays manage to enter our atmosphere ending up next to us. The only thing is that they are invisible to the naked eye.

**Cloud 2:** - And what's your relationship to this radiation?

**Strange Cloud:** - When Wilson returned to Cambridge, where he used to work, he thought of artificially creating all that situation he had experienced in the mountain in a much smaller space, in his lab. So he created me – otherwise known as Cloud Chamber, that is a cloud inside a chamber!

**Cloud 3:** - But, come on, tell us about it! That's why we couldn't distinguish what you were, closed in a box as you were, could we?

**Strange Cloud:** - That's where all my secrets lie hidden! That's where I come from and that's where Professor Wilson's inspiration comes from, too. Do you feel like finding out more about it or are you not in the mood for a bit of science?

**Cloud 1:** When it comes to finding out more about secrets, we are all ears!

**Strange Cloud:** - Well, I'm going to describe to you how I come into formation and how I interact with light and the space surrounding me.

My vehicle consists of: (**PowerPoint**)

- A transparent box, so that one can look through it.
- On top, there's some piece of woolen cloth so its humidity can be preserved in there.
- At the bottom, there's a metal black base that prevents light from being reflected.
- And a spacious container or wooden box to help us get in, me and my friends. But let me introduce my invaluable colleagues to you.
- Isopropanol or Isopropyl alcohol, what we now know as 95% absolute alcohol. It looks like the famous ethyl alcohol «dog» with its two carbons, six hydrogens and one oxygen. It should be kept away from human eyes as it is an irritant and will cause pain and tingling. That's why it is recommended that anyone using it should wear protective glasses.
- Dry ice (white foam) that's in -78.5 degrees Centigrade. Dry ice isn't so easy to handle as special gloves should be used when touched as it will cause cryogenic burns to unprotected skin.

- And last colleague, a classic, powerful torch with a hot wire filament lamp built into it.

**Cloud 2:** - Now we're talking!!! Simple things!

**Strange Cloud:** - Well, my relationship to dry ice is a bit icy, so to speak, but that's how things are! (Dry ice is chasing the cloud).

**Cloud 3:** - And then what?

**Strange Cloud:** - Here's where magic takes over!

You take care to as much isopropanol as it makes the cloth in the container soak up enough to keep it in, not let it dribble, after it has fallen on the cloth in question.

Then dry ice is spread on the bottom of the box and on top of it is the metal plaque placed.

Last but not least, the plastic container is put on top. That's it!

Lights go out! This helps create quite an atmosphere! A very good blackout is mostly required for it!

The torch comes on!

You need to be patient for a while...

The ambient room-temperature warm isopropanol in the wet container cloth starts to evaporate. While it comes down onto the metal plaque, it cannot but get too close to the extremely low temperature of dry ice.

And voila! That makes me! The weird cloud you've just met!

**Cloud 1:** - That means you're something between gas and liquid, aren't you?

**Strange Cloud:** - Exactly!

**Cloud 2:** - And then what?

**Strange Cloud:** - Then come the invisible cosmic particles which, charged as they are, interact with me and stir my inside up charging as they do some of my molecules.

**Cloud 3:** - And how do you react to all this mess?

**Strange Cloud:** - Simple enough; I lay them bare!

**Cloud 1:** - How do you dig them out?

**Strange Cloud:** - As they throw me off balance, I tie them all up and we all get more massive forming as do tiny droplets.

**Cloud 2:** - And what exactly do we see?

**Strange Cloud:** - You may spot instantaneous cracks shaped like tall and thin lines as long as you are attentive to detail, that is.

**Cloud 3:** - Something like smoke trails left behind by airplanes? But much more sped up?

**Strange Cloud:** - Well-done. You're on the right track. You got it. But let me see how observant you were. Now, tell me, what exactly did you see in the box?

**Cloud 1:** - I spotted some big, thick lines more than anything else.

**Strange Cloud:** - Hm, well, you spotted particles  $\alpha$ , which come from Radon atoms.

**Cloud 2:** - And I noticed some strong, straight, long lines.

**Strange Cloud:** - Excellent! You noticed muons. They are like bowling balls with great kinetic energy. When they charge the cloud molecules, they don't stray, nor do they spread out in different directions easily.

**Cloud 3:** - As for me, well, I noticed some lines as frizzy as big English question marks and others as flickering as zig zag lines.

**Strange Cloud:** - Huh, perfect. You spotted exactly the opposite. You 've got Photoelectrons and Positrons. They are smaller and lighter, with low kinetic energy that allows them to bounce within the cloud, thus dispersing more easily.

**Cloud 1:** - So you are a learned, educated cloud!

**Cloud 2:** - Yes, a cloud «physicist»!

**Cloud 3:** - I would also add: a cloud detective!

**Strange Cloud:** - Right. That does justice to cloud detectors, in English, doesn't it?

**Cloud 1:** - Nice, nice, Weird Cloud. What's the use, however, of what we've said?

**Cloud 2:** - You see, we are the ones that carry within us precious rain, water, and take care of the farmers' fields.

**Cloud 3:** - A mom, a mom! I will have to disagree here. I may not be so learned, so educated but one thing I know for sure: Weird Cloud has its own role both in science and history, don't you weird cloud?

### ***Music Background (Hevia - Busindre Reel)***

**Strange Cloud:** - Indeed! In 1927 I helped Professor Wilson well as his colleague Compton win the Nobel Prize in Physics. Besides, Professor Anderson, who later discovered Positrons in 1932 and Muons in 1936, thus winning the Nobel in Physics, worked with me, too.

Science has made giant leaps ever since. There have much more been up-to-date and sophisticated detectors. Nowadays, in CERN, on the outskirts of Geneva, there are colossal particle detectors, like ATLAS or CMS, which have helped build through the discovery of HIGGS, the so called God particle, what we have so far thought of as the particle puzzle in

Physics.

**Cloud 1:** - And what's so godly about it?

**Strange Cloud:** - That along with the Higgs field both explain why the rest of the particles have mass. So much for the history of matter. I will tell you more about it some other time. There's more to it, though: The discovery of such particles as the positron led scientists to create as useful appliances as the so called Positron Emission Tomographer, otherwise known as PET.

**Cloud 2:** - Hold it, I have heard of that! One of my friends' grandfather has got a ... what's its name -- PET scan?

**Strange Cloud:** - I may be on the old side for a cloud, but correct me if I'm wrong, I'm still bearing up well, still on the ball – so to speak; nor am I currently on bench!

**Cloud 3:** - Whatever do you mean, Weird Cloud?

**Strange Cloud:** - What I mean is that I added my bit to particle science and I think I can still be of service and so can you...

**Clouds 1,2,3 (all together):** - Ok, we're all ears!

**Strange Cloud:** - I think that the CERN detectors may be ultra-modern but at the same time they are way too heavy and big! They aren't easy to carry and definitely not easy to access. I, on the other hand, may be an unsophisticated, small and cheap detector but certainly convenient enough for, let's say, a school. For example, I could make myself fit into a pupil's desk and help them understand what cosmic radiation is all about. I was wondering if...

**Clouds 1,2,3 (all together):** - If?

**Strange Cloud:** - I was wondering if you could carry me on your back and travel all together as far as schools and libraries so that children can learn the basics about particles? Do you think it would be hard to do so?

**Clouds 1,2,3 (all together):** - Are you kidding? It's an honour to get to know you. We are honoured to be your assistants. Come, get on, cousin, and while we are travelling, you will be telling us more stories and we will be singing a song for you!

*I believe I can fly... (R. Kelly)*

