



Chapter IV - 1

Reality is a surreal arena: a boundless fabric of sparks, which extends across a dark and cold universe. Each spark, devoid of any spatial and temporal extension, fluctuates in the emptiness of the unperturbed oblivion. They have been given harsh names, which crystallize their being in discernible entities: clusters of galaxies, if you please. Within each galaxy, a gigantic sandstorm of millions of millions of grains revolves ceaselessly about the black core. They chase it, forever, and keep falling onto it as lovers fall in love... but they can never reach it. One day maybe, they dream, to make sense of their own existence. No companion ever returned to them, to tell them how it feels to reach it, to touch it: to become part of it. Every day they start anew, endlessly. Perhaps, that is why they are named stars, someone ventures. But there is more to disclose there, for they know not of days and nights, and yet they keep falling in their majestic quest for the unknown. Chasing their pointless aim, each grain does shape the time for billions of fragments of matter that follow its pathway. The sparkling slipstream shines of such fragments, which shatter in atoms of light called solar systems. Someone even ventures that there is more to be disclosed, looking carefully within each of them: a brand-new kind of existence, named life, which springs from itself and replicates the chase of those stars. No more than a speculation, possibly, for should anything exist smaller than solar systems, its existence would be utterly insignificant.

“Run, U, run! To that rock, fast!”
 “I... I cannot run more... I’m tired!”
 “Come on, we rest there!”

You had run for a long distance without turning back, without saying a word. Exhausted, Ujana slows down panting heavily: you run back and lift him up by his shoulder, until you are both covered behind a large rock mass. Fortunately, only the sparkling ocean and the sky at night stand out behind him.

“What h... what happened, why did we... hmpf... run away?”
 “There’s something there, in the woods, I’ve seen it. It was scary, it ate my stuff and... it was near, so... so I...”
 “But what did you see?”
 “I... I don’t know! OK, I didn’t see it clear, I felt it, I heard some noise between the trees and there was a mess on the ground, on my bike, everywhere...”
 “Really? So scary... Did it follow us?”
 “No, I think no” – you reply hesitant, while standing up to have a look beyond the rock.
 “And what if it follows us? What do we do?”
 “It will not come here; it would be already around...”
 “Are you sure? I’m scared and I’m too tired to run.”
 “Yes don’t worry, it’s all OK, we are safe.”
 “And how will we do now with the bike? Do you want to...?”
 “Oh, right, the bike...” – you grumble – “No, I don’t want to go back, I don’t know what’s there but it’s really scary.”
 “...” – he looks down in sign of resignation.
 “I’m sorry U, that we went back and we didn’t take it, I’m really sorry... I couldn’t know that before.”
 “It’s OK.” – he smiles – “What do we do now?”
 “Now... Well, we can’t go back anymore so let’s move on to the lighthouse, to find your relatives. Is that OK for you?”

With these words, you both leave the massive rock mass and head back to the lighthouse. You push the child to move rapidly in front of you, without ever turning back, while you carefully monitor the surrounding area. You feel you are doing everything all right, but that ultimately there is not much under your control.

Luckily, only a few minutes later, the beach becomes larger and flatter, keeping you far from the woods and with a broader line of view, which is reassuring. Soon you get back to the point where you had stopped and you rapidly leave it behind, pleased and with no hesitation. Ahead, the landscape remains seemingly unchanged, with bushes and dunes that draw your attention every now and then. Ujana walks fast next to you, sometimes looking down at his feet, sometimes all around. He seems determined to reach the tower but his silence and eyes, immersed in his thoughts, seem to go in the opposite direction.

“Hey, are you OK?” – you ask – “You’re too silent.”

“Uh, yes, sorry. I’m fine thanks.”

“Sure? You look thoughtful.”

“Yes yes, thanks. I was thinking about what we found there.”

“Really? I’m sorry it scared you.” – you smile – “Look, it will be all right: we’ve walked for a while and it’s very pleasant here, with this view on the coast and this fresh wind!”

“You think? But how can you be sure?”

“Well... because we are far from the woods, and the animals that are awake will not trouble themselves to bother us. No?”

“Animals? Which animals?”

“I don’t know... any animal?”

“Ah, no... not about that. I was thinking about my place...”

“Your place?”

“Yes, my place, you remember no? With all those trembling lights. I can’t really understand what I saw.”

“Ah, those lights, you’re still thinking about it!” – you say loud, disclosing a sincere surprise – “What is so special about it? Really, I can’t understand it.”

“Why not? I told you, mom would not illuminate that side... I mean, there’s no road from the top of the hill, so why should I come from there?”

“...”

“You see, isn’t it strange?”

“Well, I can’t say for sure since I’ve never seen it but, as I said, from this far it’s easy to misjudge it.”

“Maybe, but why would she... you see what I mean?”

“Yes, I think so” – you reply compliant to reassure him – “but you remember the explanation I gave for that.”

“What explanation?”

“That story about the higher temperature in the air... we called it optical illusion: trembling lights, distorted rays... things like that. There’s nothing strange about it, nor to worry about!”

“Ah yes, I remember it. But who made this illusion?”

“Who, you ask? Come on, no one made it!” – you laugh – “It just happens, it’s natural... nothing extraordinary about it!”

“Natural? You mean, it can happen that one day I go to school and, by chance, on the road I see an optical illusion?” – asks the child, with eyes wide shut by wonder.

“...” – you keep listening, amused by the conversation.

“I remember when my mom made some games with sticks and colors and she called them illusions, or magic... but that time it was her, I saw it! So how can they create themselves here? Can it be... another illusion?”

“No, no, it’s not an illusion, illusions exist in... I mean, they’re not real, they only trick our mind into believing what we see, even though it’s not as it seems. Do you see what I mean?”

“...”

“Hmm, OK, simpler: an illusion is something that in principle is completely normal and explainable but which makes us believe in something that is actually not true.”

“Like when I have a fever and I feel cold, but for my parents it’s warm?”

“Yes, good example! But some are even better, like mirages or this one: light that trembles and moves... yeah, it all makes sense.”

“But who makes these illusions? Torches never move like that at home: they’ve always been where they had to be!”

“Well, in a sense no one. As I said, they just happen... it’s how nature works. We can only try to understand it, so that, when we see something, we can guess what happens after.”

“You mean, like a fortune teller?”

“Well, not exactly... but you got the idea!”

“I like it!” – he exclaims, amazed by the explanation.

“Yeah, it’s great you like it, it’s awesome!”

“Yep, and I’m very good at natural philosophy, you know? I’m the first in my class and the best among all my friends!”

“I’m...”

“And I like books a lot, especially I like reading them on a tree in summer, when you’re alone and no one annoys you and you can disappear from the world and it’s all so nice! And when you are on the top, you can see things that you’ve never seen before, or from another point of view, and I feel like an explorer in search for a new land and it’s so cool! And when I’m tired of eating fruits and climbing, I lay on the largest branch and open my book of philosophy, or devotions, to read and see figures. I can stay there one, two, three hours, until my grandpa gets worried that I disappeared. That’s so bad, actually... but whenever I can, I always return up there again, I love it so much!”

“I’m glad you like it!” – you smile.

“Yes yes, I like it very much. Last week at school we made an experiment and it was so fun! We measured the volume of liquid that is moved by a sphere when we immerse it: so cool! I was the best, the teacher asked me to help her measure the height of...”

“Ah-ah, I see you like it a lot!”

“Yes yes, I do! And I know all definitions, can you believe? Circles, squares, everything! I know how to measure distances, how to simplify long expressions, how to do operations... I’m always the fastest” – he continues enthusiastic – “and I’ve even discovered a trick to solve them faster. Well, my teacher says that it’s a bit like cheating but, well, it works almost always so why not? Anyway, I can always do all her exercises and she says I’m very good. You can put me to the test if you like!”

“Oh no, I believe you, I...”

“No no, you don’t! Let’s play, you can ask any... Ah, but my teacher is not here, she cannot tell if it’s correct...” – he murmurs with a cute disappointment.

“I said I believe you! I’m sure you’re very good at math and I’m very happy about it. I think it’s good that you like science, and that you are so passionate about studying.”

“Really you are happy and you think it’s good?”

“Good? Very good I’d say! It’s a great skill for your future. You can build things, understand what you see around you and discover other tricks like that, which will help you in everyday life... which is quite cool, isn’t it?”

“...”

“What?” – you slow down – “Did I say something wrong?”

“You say it’s good that I study it, and I like that, and everyone says I’m good...” – adds Ujana, with a sad look – “but still, I cannot explain that optical illusion we saw. It’s so bad... Does it have anything to do with circles, lines or triangles?”

“Well, in a sense yes... but this connection will be clear to you only in a few years, now it’s too early, don’t worry about it. When you are my age, you will certainly understand why!”

“But I studied all the book this year and there’s nothing about things moved by the weather. Were you joking, maybe?”

“Joking, are you crazy? It’s all true, of course.”

“So, how can you explain it if it’s not written in my textbook?”

“Oh well...” – you smile – “there are many books you should read to understand it... More advanced than your textbook, and much harder, but which require everything you learnt so far.”

“...”

“You cannot expect to know everything from the start, it takes time... but the more books you study, the more you will discover a lot of new beautiful things, just like this optical illusion!”

“You think?” – he asks, wishful – “I hope so. One day, my dad brought home a huge book with beautiful illustrations, really, it was impossible! It seemed English but it was not, with strange symbols and weird figures. Once I opened it and it was full of

impossible drawings. The hardcover was scary too, and the title meaningless... but it was so interesting!”

“Ah nice, you see! That’s exactly what I meant. And there are thousands of books of this kind, certainly even more complicated. Still, if you like it and you study more, one day you will understand it all. Can you imagine?”

“No, I cannot, but it sounds so cool!”

Finally, the atmosphere had become very relaxed: the weather ideal and the path, lightened by the bright moon, looked safe ahead of you. You have walked a long distance from where you left the bicycle, much faster than you estimated. With this pace, you believe, it won’t take too long to reach the lighthouse.

Meanwhile, you silently check the phone every now and then, trying not to make him notice it. “Still isolated, how come?” – you wonder – “Maybe I should have cleaned it after the rain...” You remember when it fell and you took it out, covered in sand. It didn’t draw your attention at that point but now, with no signal... Thoughts like these fill up your mind while the child keeps talking and talking, happily, as if nothing bad had happened. That is why you finally give up with it, once you realize that it was only making you nervous. Indeed, everything was going perfectly so far. As you said, experiences like this happen once in a lifetime so you try to live it as much as possible. Both for you and your new friend.

“Hey, what are you looking at, there?” – says Ujana, peeking at your left hand in the pocket – “Did you hear me? You didn’t explain to me what we saw there! Is it related to what I studied?”

“Oh, sorry.” – you fall back into reality – “Of course I was listening. Yes, I can explain that illusion if you like... but I’m not sure it was, in any way, described in your textbook!”

“Why not? Let’s try, now I’m curious! Maybe I forgot it!”

“Well” – you smile – “I would not be so sure... Anyway you’ll see, it’s really simple. First, by any chance, do you know that light is both a wave and a particle?”

“A wave, you mean like the waves in the ocean?” – replies the child, pointing at his feet immersed in water.

“OK no, sorry, my fault, that’s not what I... OK, let’s take light, just light: light moves on a straight line, right?”

“Which line?” – asks the child.

“Any line, I mean, any direction, it doesn’t matter.”

“Any line... ah yes, you mean lines like the shadow from the window or from the clouds after it rains” – he exclaims with remarkable self-confidence – “But here we are in open space, and there’s lot of space... so here light moves in all directions, no?”

“Well” – you smile again – “if we assume that light moves on a line, light moves always on a line. What’s important is only that it doesn’t bend, that simple” – you explain, enriching it with fancy gestures – “Well... yeah, let’s say never.”

“Why? I mean... you are assuming it, but I was not. Do I have to assume it with you?”

“Yes? I mean, since this is how it works, let’s simply consider that light moves along a line, OK? Nothing complicated in here.”

“But how do you know that this is true?” – he insists – “Light doesn’t move at all, it’s simply everywhere all the time, wherever there is the sun or the moon... I don’t understand, sorry.”

“Fine.” – you take a long breath – “It’s true because brilliant people studied it before, and all the amazing things we built in the last century work thanks to this information.”

“Where?”

“Where what?”

“Where did they study it, those people... on which book?”

“No no, not on a book... They discovered it by themselves, studying light... observing how light behaves for many years!”

“For many years...” – murmurs Ujana, astonished – “So they must have had a very good sight because I can’t see any line here, to me it doesn’t move at all... Can you see it too?”

“No, U, I cannot” – you answer disappointed – “No one can. They didn’t do it with the naked eye, they used special instruments to discover it.”

“...”

“Anyway, that was not really important. Let’s simply assume that light moves on a line because people discovered it... OK?”

“OK. If the world assumes that light moves always on a line, I’ll do it too...”

“Fine. Then, let’s also assume that light can move in many different ways, depending on the properties of the materials it passes through: if it’s more dense, if it’s less dense, if it’s water, if it’s air, things like that, OK?”

“OK...”

“Great. Now, let’s keep in mind that these properties, some properties, that are characteristic of every material, let’s assume that they can be modified by changing the temperature... for example, heating up the air. Did you know it?”

“No... I know that if you burn something you can use it to cook, but then your eyes hurt and it’s very unpleasant.”

“Yes, OK, it’s all connected somehow. Now, let’s put together these pieces: light moves on a straight line, this direction depends on the material (in this case, the air) and temperature can modify its properties. So... if you change the temperature you change this direction and, to us, it seems like it is oscillating! Easy, isn’t it?”

“But I didn’t change the temperature.”

“Oh no, not you. Street lights are hot and maybe there is fog or wind so together it seems they’re moving, but it’s only due to the air heating up and cooling down rapidly.”

Ujana stays silent for a few seconds and slows down, looking at the soft ripples covering his feet. He even looks at you once or twice, as if, somehow, he was indeed willing to reply to your explanation, but every time the words got stuck in his throat. You give him time to think about it, while enjoying the beautiful landscape you were walking through. Suddenly, he stops and turns his eyes at you with a defiant attitude.

“Something is not clear?” – you ask.

“I’m not convinced by your explanation” – he murmurs – “You asked me to assume three things: one about how light moves, on a straight line, one about light and materials, and one about temperature which, in some way, modifies the material.”

“Yes... then, what?”

“What? Couldn’t you simply explain that light changes its direction, instead of explaining three different things? Now if I want to tell this story, I must explain three arguments and how to connect them instead of one.”

“But...”

“Maybe you are not very good at teaching, are you?”

7

The beach unfolded for another kilometer after the first bay. Ahead of the turn, the landscape looked similar to the one behind: wide seashores, copious vegetation and undulating lands made of small dunes. The treetops got even darker on this side and the moon seemed intentioned to hide for a while behind the clouds.

“I’m sorry, I didn’t have to” – he whispers.

“It was not very nice from you.”

“I know... I’m sorry, I didn’t want to offend you. I only...”

“Don’t worry, it’s all right... nothing happened.”

“But you are offended, I can see it.”

“I said that it’s all right. Please.”

You keep on walking silent, looking far ahead. The child, visibly sad for the situation, walks next to you with a glum face. You feel that your reaction was exaggerated and that it is rather childish to get angry with a kid, but his words had touched chords that you didn’t want to expose. There is nothing you can do but waiting a few minutes, until the nervousness disappears. Which is not late to come, a hundred meters further.

“Sorry, I got nervous” – you break the silence – “but it’s not really your fault. I didn’t have to react that way.”

“It’s OK, it’s my fault, you were so kind to explain the...”

“I only got disappointed” – you interrupt him – “since I did my best to explain it to you clearly, and I put a lot of enthusiasm

in it. I also feel that I did well, so your words were unexpected... but I'm sorry, I definitely exaggerated."

"It's all OK, come on!" – he repeats, with a very big smile – "Let's forget about it and let's talk about something else?"

"No no, let's continue if you want. I would like to answer your questions and convince you about the story."

"Oh, then yes, please!" – he smiles – "Go go, I'm all ears!"

You pause for a while, to take back the concentration and to emphasize the new start. The sound of the waves, growing in the background, makes this moment unintentionally solemn.

"So, was it clear why it is good to know those three arguments, instead of just that one information?"

"No, not really, I'm sorry. Can you explain it again?"

"Sure. The reason is simple but, unfortunately, school doesn't teach to think this way..."

"..."

"So, first let me ask a simple question, OK?"

"Yes, sure... I hope I know the answer."

"Well, there's no answer to remember..."

"No?"

"No. I mean, it's good that you care about notions but this is not everything, you know that right?"

"..."

"Maybe that is a bit abstract." – you think out loud – "Do you see what I mean?"

"You care about notions?... Why do I study, then?"

"Well, because notions are important, but more important is learning to think and solve problems even if you've never studied how before. What's really useful in life is knowing the relevant information and being smart, not remembering countless things!"

"But this is what we do at school: teachers never taught us to become smart. Does it mean that all these years were... useless?"

"No, of course not! But you see, it's like preparing a delicious cake and forgetting to add sugar: it won't be too successful as a cake. Even better, it's like a cook who remembers all ingredients

for all recipes and dishes, but not how to properly combine them. Do you think she will become a good cook in life?”

“So, what I know is like the ingredients for a cook, and now I should learn how to use them... and if I do it, I will become smart: is that what you mean?”

“In a sense, yes. A good cook must know many recipes, but that’s not enough.”

“So my mom is a great cook because she knows many recipes and she also prepares delicious dishes!” – he exclaims smiling.

“Yes, I’m sure she’s super good! Anyway, back to our topic: it’s important to know many formulas and concepts, but it’s even better to know how to combine them. This will be more and more important later, you’ll see it yourself!”

“Cool, I understand now!”

“Great. Now, let me ask you a question: if you were that cook, would you prefer to remember thousands, millions of recipes for every single variant of a dish... or would you rather remember only a few important combinations, from which you can deduce, with your expertise, how to create all those variants?”

“Well, if I really had that expertise, I would prefer the second, to remember only a few.”

“Of course, it’s natural. It might seem strange, but this is why I asked you to remember three notions instead of one.”

“Didn’t we say that it’s better to remember fewer things?”

“True, but these are like the important combinations for a cook. If you know them, you can explain not only this illusion but many, many more phenom... things you see in nature.”

“Ah...”

“Think about it: to describe everything, one would need to remember millions, billions, an infinite number of explanations, since two situations are never completely identical. Instead, it’s much wiser to remember, say, a few hundreds, maybe hard, but which allow to explain everything. Isn’t it a great idea?”

“Really, is this possible? How can one do that?”

“Well, that’s precisely what science does: scientists do their best to discover the most fundamental objects and the laws to

combine them... just like a smart cook knows the ingredients and the useful tricks to prepare all dishes.”

“...”

“Yeah. So, now that we understand it better, I can tell you that those three things we assumed are, in fact, some of these laws! So, it’s true that you have to remember three things instead of one, but you can now use them to explain a large number of other cool effects, even... why not, other optical illusions!”

“You mean, instead of one explanation, you gave me three (intermediate) explanations for this illusion... with the advantage that now I can use them also for many other things. Right?”

“Yes, exactly!”

“But this is so cool!” – shouts Ujana, enthusiastic.

“It is, science is too cool!”

“So, why do we memorize all those notions at school?”

“Well... I cannot say for other subjects like history, which are as important... but in subjects like math, or physics, these notions are tiny parts of the rules we have to describe nature.”

“Oh...”

“Yes, I know that they seem a lot and completely unrelated but trust me: they are not! And one day, soon, you’ll find it out by yourself and remember this conversation!”

“I hope. Now it’s all strange... but if you say so, I believe it.”

“Sure. One day, maybe a few years from now, you will even understand that weird book that your father brought home. You’ll see how things become simple by then!”

4

The walk was very nice and pleasant along the beach. Only now, a little further ahead of you, the sandy coast seemed to crash onto a rocky formation. Something that looked more and more like a cliff, judging from its dark, prominent shape. Yet, there was no reason to doubt you would be able to pass it, once you reach the base. During this time, Ujana has followed you a few meters behind, brooding over your words with a curious smile and absent

eyes. You feel very happy and proud of your explanation: you did the right thing to motivate him, especially in that moment, and you did it in the best way. While he keeps on walking gazing at his feet, you raise your eyes up above, where hundreds of tiny stars are just appearing through the clouds. “So beautiful... A pity” – you think – “that he’s still lost in his thoughts.”

“Look, U, look at the sky. So many stars already!”

“What? Ah, yes... nice” – he answers, turning for a second.

“Did I say something wrong?” You walk a few meters more, recollecting the past conversations, the words you used, his smiles and surprise. Ujana keeps walking, looking at you every now and then, until he slows down and breaks the silence, awkwardly.

“Hey... Can I ask you a question?”

“Sure. Is it all OK?” – you answer without hesitation.

“There’s something I don’t understand... but maybe you can explain it, since you know so many things.”

“Oh, no” – you laugh – “I wish I did. Anyway tell me, what did you want to ask?”

He pauses, takes a deep breath and carefully formulates it.

“So, if science is as cool as you say, so cool that it can explain everything... even illusions... why does not everyone know it?”

You look at him smiling, surprised by such an unexpected and reasoned question. The answer seems rather obvious to you, but you take some time to weigh the words and to emphasize that you are giving it the importance it deserves.

“Well, that’s a very good question” – you heard this incipit so many times that it lost its value – “One simple reason is that, while science is important, society also needs many other competences: to bake bread, to deliver mails, to clean roads... If everyone

became a scientist, there would not be enough places, and not enough people to take care of all the rest!”

“Fine, but they should at least know some, since it’s so important as you said!”

“Yes, in principle that would be great but, you know, it takes many years to become a scientist... plus, it’s hard to study, and people do not w... cannot spend this time. Also, as I said, we need many professions, not only scientists: this is essential for society. Can you imagine a world without doctors, or construction workers to build a bridge?”

“I see. Sounds like it’s a pity for them, isn’t it?”

“Somehow yes, especially if they don’t acknowledge its role. But you see, there are many other awesome things that scientists rarely experience in their lives... you can easily imagine, being focused on your study day and night, sometimes obsessed by that... often it’s hard to find a good balance between science and ordinary life, unfortunately.”

“You mean, it’s a pity also for scientists, because they miss a lot of other things?”

“Yes, correct. Sometimes scientists are aware of it, sometimes less. Anyway, at the end of the day, it takes a lot of sacrifices to achieve a goal (like many other jobs), so it’s natural that something must be left out.”

“I didn’t think about it before, now that you say it.”

“I can understand it, it’s not easy to see from outside. One usually describes science as a romantic endeavor toward a greater understanding of reality, but that’s not the whole picture. For example, people sometimes take great scientists as a model, and they put them forward as examples of success in life. Many people in the New Age have the highest admiration for Tesla or Einstein, for instance, but they ignore that, had they met them, they could have a different consideration of the person.”

“...”

“Person and scientist are two sides of the same medal, and we may not like both. So I’m happy that you like science but we must face reality too!” – you conclude, trying to downplay it – “By the way I talked too long sorry... Did I answer your question, at least?”

“Somehow, yes. I understood that science is beautiful and hard, and that not everyone can learn it for many reasons... but why should someone prevent people from studying?”

“What?” – you ask with sarcasm – “Who would do that?”

“I don’t know now, can this happen?”

“Well, apart from its cost, students are usually encouraged to continue their studies after high-school. They can enter medicine, mathematics, physics, chemistry, engineering, biology and many other careers... Eventually, anyway, since not everyone likes studying, there’s a natural balance in society.”

“So, for instance, there’s no need to create a book that is, on purpose, not accessible by everyone...”

“What... of course not! Books have a cost, which can be high, but, luckily, the ancient times are gone. Now culture is free or, at least, we are doing the best in this direction.”

“I see... so, there is no need to put a lock on a book?”

“Hey, are you kidding me, U? – your face takes on a worried expression – What are you getting at, I don’t understand.”

Ujana walks on a few more meters, reluctantly, when he stops and shyly turns at you, in a way that makes you fear for the worst. You hesitate to come closer, waiting for him to explain.

“Do you remember that old book I told you about, the one that my dad brought home, full of impossible drawings?”

“Yes, of course, we just talked about it.”

“Great. Well... since you’ve been so kind with me... I thought you might want to have a look at it, one day.”

“To have a look at your father’s book?” – you ask surprised –

“Yes, of course! I’d be happy to have a look when we get home... but you just scared me now. Why did you stop?”

“Well... I thought you might want to see it now...”

“What... now?”

Ujana drops his heavy leather bag on the wet sand and slowly goes to bend down on it.