

The principle of relativity-emptiness

Since Nagarjuna until Einstein

Conference given by Laurent Nottale during Ringou Tulku Rinpoche 2009 teachings organized by Bodhicharya at La petite Pierre (France).

When he commented on the text 'The transmission that introduces to Dharmakaya', Ringu Tulku Rinpoche has invited the astrophysicist Laurent Nottale to say a few words about the principle of relativity. Subsequently, many participants expressed their wish to have more details about this point, and especially concerning the possible link with the Buddhist concept of emptiness. The theory of relativity is often perceived as mysterious and surrounded by a dense fog that only some adepts of cosmology or particle physics are able to disperse. However, this essential principle of modern physics can easily be experimented by everyone, and his understanding may lead to deeply modify our way of considering the everyday world. Therefore it appeared necessary to present it more precisely and an informal talk was organized. LdM

LN

The main reason why I'm here is to answer your questions, so I'm going to make a short introduction and after that we will have time for questions. I would also like to emphasize that we are here for Dharma, not for science, therefore this talk should not be considered as a scientific one. My motivation is that science may help to bring a complementary understanding of what relativity and emptiness are, with the idea that, finally, the scientific relativity of physical objects may be a metaphor of the way our mind works. Note that I'm not talking about realization. As Rinpoche told us, it is just a finger that points toward the Moon, not the Moon itself. However, if science may help, OK, I will be happy. Actually, what happens is that the scientific view of relativity is very close to the Buddhist view of emptiness. Maybe it is the same... you will decide by yourself.

What may be useful is that when I say something about the Moon, about an apple, or about gravitation, it may reach a wider meaning if we also apply it to our thoughts and emotions. In Dharma, we also use the concepts of rest and movement, of energy, of attraction and repulsion. Do we have attraction and repulsion in our mind? In physics, there is clearly attraction and repulsion, even though, as we will see later, they only exist in a relative way and do not have any intrinsic or independent existence. So, in Dharma, we use many metaphoric terms that are coming from natural sciences. Actually, all terms are coming from natural sciences! Because our mind has no characteristics! Therefore we have to use the characteristics of physical objects to characterize it, to try to speak of it. In this case, we could even say that the metaphor is maybe the thing itself, because our mind being finally empty of intrinsic existence, we always use as example the so-called "exterior" (in brackets because it has also no intrinsic existence).

Now let's talk about the main subject which is the theories of relativity and the principle of relativity. In the title of this talk, it is written '*since Nagarjuna...*'. In the West, relativity is not commonly attributed to Nagarjuna. It is true that there has been no communication between East and West concerning this precise point. From the point of view of the official history of science, it goes back to Galileo as concerns relativity. He is known as the one who discovered relativity. The original book of Galileo in which he sets the principle of relativity is the *Dialog on the two systems of the world*. It is really worth reading it even nowadays, because, through 200 or 300 pages, he uses an incredible number of examples to show the relativity of motion. He shows it in a way, then in another way, etc., it is very didactic. Actually, it should still be taught this way today. However, now we have access to the writings of Nagarjuna that are two thousand years old, and in particular to the *Madhyamika* teachings. In English, this book may be called *The middle way*, but the title has been translated in many different forms. In this book there are chapters on relativity and some sentences are nearly word by word those of Galileo. It is really extraordinary. Nagarjuna reviews the various components of existence to demonstrate the emptiness of all these components. Among them, of course, the most important for us are those concerning the mind, like sensations, perceptions, mental objects, consciousnesses... But there are also things about the aggregate of form (i.e. physical objects) and, in this case, it is physics. Of course, it is still philosophy because there is no equation and no mathematics, but it is a philosophy of Nature. In Nagarjuna writings, there are passages concerning the relativity of motion, the relativity of position, the relativity of scale, the relativity of time... there is really a deep understanding. There is even a chapter about space. In this chapter he says '*gravity is like space*' [according to Batchelor's translation: is it an anachronism?]. Einstein rediscovered it "only" one century ago! So this is really something extraordinary, and this proves, at least for me, that it is the same relativity what we call relativity in science and what we call relativity in Dharma, as well as the emptiness associated to it.

Now let's talk about Galileo. Galileo has explicitly erected relativity as a principle. Therefore relativity was not discovered by Einstein. Einstein generalized it to other objects, to gravitation, but it is Galileo who set it as a principle. In his book, he clearly says '*we shall erect that fact as a principle*'. Then he gives a definition: "for all things that participate in it, motion is not detectable: it is like nothing, as if it was not". Actually, his definition is very interesting because it is the emptiness aspect of motion (its absence of intrinsic existence) rather than the relativity aspect that is emphasized... which indicates clearly that both are connected. Thus, the question here is the problem of motion. Consider the motion of something, like this book. When I move it, it seems to be in motion. When I stop to move it, we say that it is in motion, and when I stop to move it, we say that it is at rest. Both concepts are opposed. If it is at rest, it is not in motion, and if it is in motion, it is not at rest. It is what we usually pretend. It seems to be opposite and contradictory. Then we may calculate the speed of the object. We say that it is going at one meter per second for example. Everything seems perfectly clear. But... No. It is not so clear. Look at what happened. What allowed us to say that the object is in motion is that actually we have compared the motion of the object to the Earth.

At this point, Western science adds or, more precisely, qualifies things in a different way than Dharma, which can really help us. Western science has tried to qualify motion in an organized way by defining explicitly the reference system comparing to which there is (or there is not) motion. In Nagarjuna writings, the result is finally the same, but the description

of physical objects remains dualistic. He has to compare this to that, that to this, and so on... so it is very complicated because it is possible to compare many objects to many other objects. On the contrary, Western science has tried to reduce the properties of the object that is used as a reference system, such as a ruler or a clock, to its essential properties required to insure its function of reference. If you use a ruler, you do not need to know if it is made of plastic or metal or anything like that. It just needs to be straight and have small ticks. In other words, you only keep from one object what is necessary to compare it to another object and this becomes a reference system. Then, the reference system, or coordinate system, becomes something abstract in a way. Of course, we need a real object in order to manifest it explicitly in an experiment, but there is a kind of abstract object which is the reference system and which can make us really understand the nature of the relation. Now, here is the key point: one is allowed to change the reference system. Instead of always using the same reference system, we admit that other reference systems can be used and are as valid as the usual one to describe the laws of Nature. This statement is precisely the form Einstein gave the principle of relativity.

We naturally tend to use as reference system the bigger object, which most of the time is the Earth. Clearly, if we look at what we do, we say that there is motion when it moves comparing to the Earth and we say it is at rest if it is at rest comparing to the Earth. But now, actually, the Earth is moving. It is turning at thirty kilometers per second around the sun! Do we feel it? No. This is the emptiness of motion. This is why the statement of Galileo is really a statement of relativity-emptiness. He said "*for all things that participate in it, motion is not detectable: it is like nothing, as if it was not*". This is his statement. It really sounds like Dharma, like when the Buddha says '*it is like an illusion, like a dream*'. He does not say that it is really a dream or an illusion, he says '*it is like...*'. It is a metaphor to show us the truth. Similarly, Galileo is not telling us that motion does not exist at all. His statement is not nihilistic. Neither is he telling us that motion does really exist by itself, in absolute way. For example, hold this book in your hand and walk in the room. There you say the book is in motion. I give you right now the proof that this motion does not exist by itself. We don't have to always compare to the Earth. Actually, we have the right to use any other object as a reference system, such as this pencil. Now hold also this pencil in the other hand and start to walk again (without moving your arms). Look at the motion of the book comparing to the pencil. Look at the book comparing to the pencil, look at the pencil comparing to the book. The book is totally motionless. Forget all the rest. Imagine you are in an empty space in which there are only these two objects. There is no other reference available. Look at one object comparing to the other. Where is motion? There is no motion. Now if there is a third object, like the Earth, motion appears. So you see that here we recover Nagarjuna tetra-lemma. Is the book at rest? No, comparing to the Earth it is moving. Is the book moving? No, comparing to the pencil it is at rest. Is the book both moving and at rest? No, it is impossible, it is either moving or at rest comparing to a given reference system. Is the book neither moving nor at rest? No, it is always either moving or at rest. So we refute all possibilities, the positive ones and the negative ones. Note that using the possibility to change the reference system makes it also possible to answer positively to all the questions of the tetra-lemma which however seems contradictory in our binary logic: is the book moving? Yes, the book is moving comparing to the Earth. Is the book at rest? Yes, the book is at rest comparing to the pencil. Is the book both moving and at rest? Yes, it is moving comparing to the Earth and at rest comparing to the pencil. Is the book neither moving nor at rest? Yes, it is not moving

because it is at rest comparing to the pencil and it is not at rest because it is moving comparing to the Earth.

Question

As a dance teacher, I practice and I teach spinning. When you spin, you feel very comfortable in spinning and you have the idea that you don't move. Everything moves around you and you are not moving. It is easy and quite fast to reach this state in which you feel that you don't move and that instead the world is moving. Many students reported it without me suggesting it to them. They discovered it by themselves.

LN

Absolutely. As a fan of relativity, I tried it myself. My experience was that at the beginning you start spinning. Then the motion is established. If you want to do that, you have to be very concentrated otherwise you may feel sick. Then, suddenly, it switches. You are totally motionless and the world is spinning. This is an authentic experience of the relativity-emptiness of rotation.

Question

It is like a train. If you are in a train that doesn't move and that the other train moves, when you look at the other train, you have the feeling that you move whereas it is not correct. But if you look at the lights or at the tracks, then you see that you don't move.

LN

Yes, exactly.

Question

Did you say something about the eyes? I did not understand... If you move your eyes, in which reference point are they?

LN

Well it depends. Actually, we may use your eyes as a reference system. Then, by moving the eyes, we see things moving. We are able to move the whole Universe! Look, I turn my eyes, the whole Universe moves! Because it is completely the same, you know, it is really non dualistic. This is one of the aspects of the true relativity. Relativity is often expressed by saying that things are relative to something else, or that this is the speed of this object comparing to this other object. However it is not enough. It makes you believe that there is a first object that would be moving comparing to a second object. But actually the situation can be completely reversed. As soon as an object has started to move comparing to another, the other object has also started to move comparing to the first one. Actually we project motion on the first object. And since the Earth is bigger than us, if we move comparing to the Earth, we will not project motion on the Earth, we will project it on us. But it is always an arbitrary projection of motion, which actually does not exist in an intrinsic way, and which therefore does not belong to any of the two objects.

Question

When you are in a station, is it the same? When the train starts, it seems that the landscape is moving.

LN

That's it. This is really the fundamental point. Relativity is an experience. And this experience in the train is really the relativistic experience. I can say a bit more about it because it is important to understand correctly what happens. We all know this situation when there are two trains waiting in a station, which makes three possible references. You are in one of the trains, you wait and maybe you want to arrive quickly to your destination. Then the train seems to start... but nothing happens. Then you think 'oh, well, it was the other train'. And 50% of the time it is the contrary. Sometimes you believe that you are starting and then you understand it was the other train. Sometimes you believe you are at rest but it is the other and you start moving. I believe I'm moving... I wait for the acceleration... and finally it is the other train which is starting. How strange! Or I believed I was not moving and I feel the acceleration... then I think 'finally my train is starting'. In fact this is all wrong. It is wrong before and it is wrong after. You are at the beginning of the truth only at the moment when your mind is switching. Here you are in the truth because here there is no absolute motion. We have a tendency to project an absolute motion on reality while there is no absolute motion. The mechanism is simple: we have a tendency to attribute motion to an object. I'm talking about motion, but it is also true for position, orientation, mass... for all that you can imagine. We have a tendency to attribute motion to the subject or to the object, but it is neither in the subject nor in the object. It is in the relation. Motion is not a property of an object. It is the property of a relation between two objects. So you cannot say that motion is here or there. You see, it is more profound than simply saying 'it depends on...'. It is non dualistic from the very beginning. So you cannot put it here or there. It is nowhere. It is in between... and more profoundly nowhere. Because if now we listen to Einstein...

At the beginning, it was believed that we could only use as reference system any object having a straight motion at a constant velocity. This is the version of Galileo and Descartes. Einstein went even further. Einstein said that if we can use as a reference system not only the Earth but also other objects, we could also use something that is accelerating. Why not? And now look at what happens. I take this book in my hand and I just drop it. Of course, it "falls". I do it again and again, it always "falls". So physicists concluded that there is something universal here. It is impossible to escape from falling. This is Newton's universal gravitation, as you know. But Einstein said 'well, OK, but once again you are comparing to the Earth'. And he had this idea that we are allowed to take as reference system an accelerated reference system, like for example another object that would be also "falling" in the gravitation field. So, now instead of considering the motion of the book comparing to the Earth, I will perform the same experiment as previously but with two objects, this book and this pencil. Now look, I drop them. During all the time of the fall of both the book and the pencil until the encounter with the Earth, from the point of view of gravitation, the book remained completely at rest comparing to the pencil. So where is gravitation? Again, forget all the rest. Imagine that you are on the pencil and that you look at the book. You will neither see nor feel any gravitation. Einstein understood it this way. He was looking at some workers who were working on a roof and he has imagined what would have happened if one man had fallen. Then he has seen, he has realized that during all the time of the fall the man would not have felt his own weight, that he would be weightless, that his weight would disappear. Thanks to this, he has realized that gravitation that looks so solid and so universal has no

intrinsic existence, that it does not exist by itself. Actually, what makes us say that there is gravitation is the acceleration. It is because it accelerates that Newton analyzed it as being caused by a force. Why does it accelerate according to him? Because there is dynamics, because there is a force, the force is due to a field, to a potential, this is the Earth attraction. But the Earth attraction has disappeared! We say that there is a force, that there is a field because there is acceleration. But here, comparing to this pen, the book is completely at rest. So there is no acceleration. This means that there is no dynamics, no force, no potential, no field. Thus, gravitation does not exist by itself in an intrinsic way. As we have seen previously with Galileo and the relativity of the inertial motion at constant velocity, gravitation is also relative and does not exist in any way in an absolute manner. Where is the attraction of the Earth? Nowhere.

Question

Now if you fall and break your legs, it is something you can feel...

LN

Yes, but the breaking of the leg is due to something completely different. Let us analyze that. Why do you break your leg? Because there is an encounter with the Earth. However, in science, as well as in Dharma, we only analyze things which are of the same category. So when you say 'If I break my leg, then gravitation exists', I answer 'No'. You are not breaking your leg because of gravitation, but because of the ground, and the ground exists because of electromagnetism and other things, not only because of gravitation. Therefore, this is not the question. The proof is the following. Newton had already shown that if all the mass of the Earth was put in its center, the gravitation field on the Earth surface would be the same. The motion of the (poor) leg and of the rest of the body would be exactly the same if all the mass of the Earth was localized in its center. Now imagine it is the case indeed. The body falls and... there is no ground. So its motion continues. The body continues to "fall", and then, about one hour and a half later, it will come back going up at the same place. So gravitation is not only going down. If I throw this pencil, it goes down. But, if I wait, I will see it going up, again and again, it is a satellite of the Earth! Throw the pencil up in the air. The place at which it starts going down is the summit of the ellipse (the orbit of the satellite) that we often approximate by a parabola. Actually, if you want to make a satellite of the Earth, you may use a space shuttle, Apollo or any other, yet, there is another very cheap way to do it. Look, I throw the pencil again. That's done! During all its motion, it is free. The pencil is totally free. No gravitation, no attraction, no repulsion, no "fall", only a completely free motion. The reason for which we have been wrong about that is that we have mixed different categories. It is true that the Earth is here and that there is an impact. But it is the impact that stops the motion of the pencil, not gravitation.

Question

Do you mean that the field is coming from the center? Because there is a field, there must be something...

LN

This is another interesting question because here we are going to jump from the Newtonian view to the Einsteinian view. In the Newtonian view, the Earth is here, it has a mass and this

mass attracts the mass of another object. More precisely, both masses attract each other. There is a force between them and it is real. The Einsteinian analysis shows that it is not true, that it is in a particular reference system that there is attraction, and that in another system, there is no more attraction. In this framework, how to understand gravitation that exists only relatively to some reference systems? Well, Einstein changed completely the usual way of describing gravitation: he attributed it to space. Instead of saying that there is a force between two masses and that each mass attracts the other mass, he said that there is neither attraction nor repulsion, that what happens is that masses curve space. Thus, space itself is curved. But what is space? To understand precisely what he meant, we need to know what space is. Actually, space is just a relation. For example, what characterizes a Euclidian space, which was the first notion of space described by mathematicians? It is Pythagoras's relation. You know, it is a relation in a triangle. Imagine a rectangle triangle, which is precisely the easier way to define a coordinate system. It may be useful to know the length of the hypotenuse, the side opposite to the right angle. In an Euclidian space, you certainly learned it at school, if a and b are the length of the two sides linked to the right angle and c the length of the hypotenuse, then the relation between these length is $a^2+b^2=c^2$. Note that this is still physics because we have to make real measurements in order to check the validity of this relation. We have to go from one summit of the triangle to the next summit and from this summit to the other summit. Thus, space is a relation and it is very interesting because therefore it is not an object, it is not a substance, it is a law, a geometric relation. A relation between what? It is not a relation between objects. Of course I can place three objects on the summits of the triangle and measure the distance between them. But if I replace these three objects by three other objects at the same places, it will be the same relation. So this relation is not directly dependent on some particular objects. It is pure geometry. This is the important point. The important point is that only the position of the object is taken into account, not the object itself. Therefore, space is a relation between properties of objects, between their positions... which do not exist in an intrinsic way but only in a relative way.

This characterizes space and the proof is that this relation can be different in different spaces. Try it on a sphere for example. Imagine that you are on a sphere. Imagine that you are a two-dimensional being. Then, your space, all you may know, is the surface of this sphere. Actually, during ages human beings have been in this situation because we used to think that we lived on a flat Earth. Then, the Greeks discovered that the earth was spherical. The question is: is it possible to characterize the fact that you are on a sphere in an intrinsic way? The answer is 'Yes'. Indeed, we can make the same experiment as Pythagoras on a sphere... For example imagine you are walking on the equator, then you go up to the pole and finally you come back to the equator by another meridian. This is a triangle, a rectangle triangle on a sphere. If we calculate the new relation between the lengths of the three sides of the triangle, we will find a different relation from the one of Pythagoras. Curvature, or being in a spherical space, well, it is that. Besides, locally, you do not know that your space is curved. If you are a human being on an Earth much bigger than you, then your first think is that it is flat. To perceive curvature, you have to perform measurements over great distances. The Greeks actually performed measurements between Athens and Alexandria, and thus, at the fourth century before Christ, we finally understood that Earth was round. Therefore, a sphere is locally flat in the Euclidian sense, but globally non-Euclidian, or "curved".

Now, try to make a kind of extrapolation with your mind. Imagine that this space, the three dimensional space we have here is spherical. In the two-dimensional case, if you are a two-dimensional being on a two-dimensional sphere, it means that if you go straight ahead you come back the other side. In the three-dimensional case, it is the same. If it is a three-dimensional spherical space, you go straight ahead in any direction and you come back the other side, nothing else. Some headache? You see, this would be a closed space that however would have no limit. It is unlimited but it is finite. This is possible. Maybe our universe is that way. We still do not exactly know, it may be open, it may be closed, but this is possible. This means that it would be curved in all directions. So, this was the idea of Einstein to say a mass does not attract the other bodies, but that it just curves space. But it curves nothing solid actually, because space is only a relation, only geometry. Then, once space is curved, all possible objects must, because they are inside space-time, follow its curvature. But these objects locally do not feel the curvature, locally they go straight ahead. Thus, the mass of the Earth curves space and in this curved space, the objects are going straight ahead.

Question

Apparently...

LN

No, this is not just apparent. The experience is that they really go straight ahead. An astronaut who is in a weightless state in his satellite really feels that he is going straight ahead. It is us who see him turning. Everything has been put into space, therefore, it is free, it is really a free motion (i.e. an inertial motion at constant velocity). What the person in the satellite lives is that he is going straight ahead. We see him turning, but he tells us 'I'm going straight ahead', there is no doubt about it. An example of this could be a cycling racing ring with raised curves. This is equivalent to a change of geometry. This is a curved geometry in two dimensions, but it is exactly the same. If you have already tried it or if you have seen it on TV, look at the cyclists, they do not turn their handlebars. They go straight ahead. Besides, we say in French that they pedal with 'the nose in the handlebars'. Try to do this somewhere else, it is impossible. Why is it possible for cyclists to pedal like that in racing rings? Because they are going straight ahead, therefore they do not need to take care about turning, it happens naturally. All the curvature is in the geometry, so what the cyclist feels is that he is going straight ahead. What we see is that he is turning. So you see that there is relativity of motion, but also of turning, of being curved or straight, and of being accelerated or not. Not only physics is relative, but also geometry. When we say 'well, this is curved' or when we say 'there is a form'... It is not so clear actually. Maybe we really see a form, indisputably, a circular form for example. If what we see were straight, we would not say that there is a circular form. But, actually, the circular form we see could be straight in another reference system! Thus, form is not absolute in any way. Geometry is not absolute. Because we see it is round, we say 'this thing has a circular form', but it is not an intrinsic truth in any way. In another reference system this round thing can be seen, not only seen but even experienced, as being straight. And this is really what the astronauts live all the time. We see them performing a motion that has a shape, a circle, but they *live* that they are going straight ahead, or that they are motionless. For them, they are really going straight ahead, or they are really at rest at the same point (if they do not move into the shuttle). This is not at all just an

illusion. Now I think we can start with the questions. Actually, there is nothing more to say. 'Form is empty, emptiness is form', this is what relativity really tells us.

Question

But if the astronauts are going straight ahead, don't they move away from the Earth?

LN

No. They experience that they are going straight ahead or that they are motionless in their frame. They are in an inertial frame and they do not feel any acceleration that would push them on the left or on the right. If you are in a train, and if the train turns, you are being pushed. They don't feel anything like this. They live that they are going straight ahead or that they are motionless if they do not move inside the shuttle, but we see them turning. So to be round or straight is not something absolute. It depends on the reference system.

Question

So they go straight ahead because they don't have any reference system?

LN

No, they have one, but it is different one. There is always a reference system from the point of view of relative existence. But they are not in the same as ours. The essential point is to see clearly that there is relativity as well as emptiness, and that emptiness does not mean that it has completely disappeared. It is exactly the same motion (of the same object in the same conditions and at the same time) that exists comparing to the Earth and that does not exist comparing to another reference system. The only way not to have a reference system is precisely to use yourself as reference, which is impossible because in this case there is no more two different objects to compare, but only one. How to define your position comparing to yourself, your direction, your motion, your size comparing to yourself? This makes no sense, it is undefined. No property of an object (or of the subject) can exist without an external reference. If the reference is the object (or the subject) itself, then it is non-being.

Question

Did you see this movie of a dancer spinning on the Internet? You can see her turning in one direction or in the other direction very clearly either if you are looking from one perspective of the brain or another, and you don't know which one is true because you can see both. It is a normal film. Could you talk about it?

LN

It is in the brain that there is a change, but it is the same motion. This is due to the fact that we have the ability to change our reference system.

Question

It is a problem because, you know, our eyes are actually receiving everything thing the other way round. The eye is a *camera obscura*. Actually, we see everything turned upside down, but our brain is programmed to put it right. I know people who stand on their head and they

say that after about two minutes, it switches. So, when they stand up, during a short instant, everything is reversed. Then it is re-programmed and everything is ok.

LN

Yes, that's it. I did it. It is very amusing because we are used to say that this is bottom and that this is up, and that we are standing on our feet. But if you inverse the way you see things, you feel yourself as if you were suspended, like a bat. And it is also true. Actually, this happens to the Australians! Now see things from the point of view of the Australians. You are Australian and you look at us. For them, they are standing up the right way, so they see that we are upside down. It is the same!

Question

I cannot really understand these things in five minutes, but anyway you understand what you understand. Now, for you, it is even more possible these stories of the Lama that puts his foot in a stone and makes an impression?

LN

I don't know, maybe. It is not understood scientifically at present moment. But what is interesting in what I'm saying is that we can really live it, not only understand it. We can experience it directly, not like in a scientific experiment involving a measurement apparatus. When there is no measurement apparatus between the object and you, the experiment becomes an experience. So you can really try it with trains, with spinning, with trying to put yourself on your head, and then you can live it.

Question

Could you be more explicit about the benefit we could get concerning Dharma based on this knowledge?

LN

First of all, to be definitely convinced that this extraordinary sentence of the *Prajnaparamita Sutra*, '*Form is empty, emptiness is form*', is totally, entirely, universally true, and also that we have a very quick way to realize it. Otherwise it may be very complicated. Form is empty... then where did form disappear? Emptiness is form...? Actually, it becomes very simple as soon as we use the concept the reference system. '*Form is empty, emptiness is form*'. To understand it deeply, you have to realize that, at the same moment, there is a form and there is also no form, because when we see a form, it is comparing to a specific reference system. Form is emptiness because it is always possible to find a reference system in which the thing disappears. At this stage, it can really help us to understand in which the reference system the thing disappears. The answer is that it is in the proper reference system that it disappears. It is in the self reference system, in itself. Now, we know how to manifest the emptiness of form, and later of sensations, perceptions, mental formations, and consciousnesses. It is precisely what Rinpoche tells us all the time, it is in the proper reference system that it disappears. It is true for any property we may consider. This property can disappear in the proper reference system. Consider whatever you want, like a color, a form, an object, a mass, a particle, and put yourself into it, in the interior of the thing, then the thing disappears. In the color, there is no color. Here we have a color. If you go in the color,

there is no color. What makes the color is a wavelength. If you are smaller than the wavelength, the concept of color does not even exist, it disappears completely. If you are *in* light, participating in its motion, light and time disappear (this is what Einstein understood at the age of 15 and what led him to built ten years later his first theory of relativity). Therefore, in motion, there is no motion, in position, no position, in particle, no particle. Then, in sensation, there is no sensation, in perception, no perception, in consciousness, no consciousness.

Sorry, this is no longer science. But, what is precisely the state of mind that makes you become the external object? This is compassion, this is Tong-Len. Compassion makes you put yourself *at the place of* other sentient beings. Not of a stone, but why not? Place yourself inside the stone... no stone. Place yourself at the position of something... no position. For example, if you call the firemen, saying '*Oh there is a fire! There is a fire!*'... '*Where are you?*', '*I'm in my home*'. Can they go to your home? No. You have to give an address. So if you give only one piece of information, you have given nothing at all. It is nowhere, your home is nowhere! The key point is that the reference system in which it disappears is the proper reference system. But if now we come back to Dharma and if we want to know what is the state of the mind that puts yourself *at the place of*, it is compassion, it is Tong-Len. Thus, there is really a very deep connection between emptiness and compassion in a very general sense: compassion reveals emptiness.

Question

It means that compassion allows you to place yourself in the reference system of someone else?

LN

That's it. Passion means to feel, compassion means to feel *with* the other person.

Question

Therefore the Lama is not changing the stone, because he is the stone. He changes himself and for us it seems that he is changing something else, because we are still thinking with 'I' and 'that'.

LN

It is said that a Buddha does not see any difference between him and us. He is us. It seems that he does not see any difference.

Question

I was also going to ask a question about the link between compassion and emptiness. But I had never considered it the way you present it.

LN

Indeed. It is the explicit use of the concept of reference system that really allows one to move among physical objects, but also in the mind.

Question

Just a few minutes ago, you said something in French, I don't know if I understood it correctly. You said that the Universe could be open or closed?

LN

Yes, this is possible. Just as two-dimensional beings could live on a sphere. You see, they have only two dimensions, so the three-dimensional space in which we place the sphere in order to understand it does not exist for them. What they call "dimension" is to go on the sphere, this is all they know. If they are very small compared to the sphere, they will believe it is flat. Then, on a fine day, they will be able to move themselves far enough and they will discover that if they go straight ahead they will come back the other side. So you need to make a mental effort to imagine this in three dimensions. It is possible. With equations it is easier, but you can do it also. It is a world similar to ours, with three dimensions, in which if you go straight ahead, you come back the other side. You go straight ahead toward the left, you come back on the right side. You go straight ahead upward, you come back from the bottom. It is closed, there is nothing else. This world is finite, but has no boundaries. It is unlimited, but finite, just as a sphere is finite. You can move on a sphere without ever encountering a boundary. This is not a world that would have a frontier, like a wall. We are used to consider that the world is finite only if it has boundaries, but in this case, it is not necessary. This world is finite, but has no boundaries. Therefore it has no center. No boundary, no center, but nevertheless, it is finite. It is possible that our world is like this.

Question

Is time also like this?

LN

It may be the same for time. Except that time could not be curled onto itself: if time was curled onto itself, we would have an enormous problem of causality!

Question

So, how was it with the example of the pencil? You changed the reference? You don't change something else, you just change... so that you become... inside the other person. And that's compassion?

LN

Yes, it is the same. It is completely free. This is indeed also compassion, but my point was to put yourself at the place of other things, so that you can put yourself in the reference of other beings. In the meditation of Tong-Len, this is what you do. You have an enemy and you think 'let's be my enemy'. At the beginning it is very difficult. And then, OK... Oh! It is for this reason that he does not like me... And you understand him. You understand why he cannot bear you. Actually, from his point of view, you do not look like a very nice person yourself. At this point, he cannot be your enemy anymore. Maybe he still believes it, but you do not.

Question

It is strange to base compassion on an intellectual reasoning. Should we understand it as an image? Because otherwise we could be completely disgusted... So is it metaphoric?

LN

No. It is always the same: you ask me questions and therefore I have to answer you with words. Therefore, inevitably, it is intellectual. But you have to experience it by yourself. Now you have to go to the train station, you have to take a bicycle, you have to stand upside down, etc. It must be the kind of doubt that shakes the basement of Samsara, as Rinpoche use to say.

Question

Are there some books you recommend to understand all this?

LN

Yes, *La relativité dans tous ses états*, but it is not translated in English yet. The title means something like 'relativity in a right old state'. It is a play on words, because relativity changes the state of the reference system.

Question

Is it the book you have written?

LN

Yes. In this book I am the unique author, but there is also *Les arbres de l'évolution*, the trees of the evolution, that I have written with co-authors.

Question

It is possible to find it somewhere?

LN

It is available on the Internet, or you may still find it in some bookshops. The editor is *Hachette*. I'm currently trying to have it translated, but it is not an easy task. Another book dealing more specifically with the links between relativity and emptiness should be finished at the end of 2010.

Well, it seems that we have to stop here. Thank you.

Transcript by Louis de Montera, edited by Laurent Nottale.