I was born in Moscow in 1948. My father, Dimitri Linde, was a Professor of Radiophysics, my mother, Irina Rakobolskaya, was a Professor of Physics at the Moscow State University. It could seem that my fate to be a physicist was sealed at the moment I was born, but things definitely could be different. My brother Nikolai is a Professor of Psychology. As for me, I wanted to be a geologist, traveling to distant parts of the world and discovering precious minerals. But when I was 14 years old, my parents took me to the Black Sea. It was a week-long trip. In the back seat of the car, I was reading two books they gave me. One was about astrophysics, another - about special theory of relativity. When we finally arrived at the Black Sea, my infatuation with geology was over. I felt like a traitor, but I could not do anything about it: I wanted to be a physicist.

Several years later, after finishing high school and graduating from the Moscow State University, I became a post-graduate student at the Lebedev Physical Institute. My advisor was David Kirzhnits. In 1972 he noticed that the standard model of electroweak interactions is very similar to the theory of superconductivity. Superconductivity disappears at high temperature because of the evaporation of the Bose-condensate of Cooper pairs. What is an analogue of this effect in the theory of electroweak interactions? The difference between weak and electromagnetic interactions appears because of a special type of a scalar field, the Higgs field. Kirzhnits conjectured that at high temperatures the scalar field also evaporates, and when it happens, the difference between weak and electromagnetic interactions disappears.

We started working on this problem together. Such phase transitions could occur only at tremendously high temperatures existing in the early universe. We argued that soon after the Big Bang there was no difference between weak and electromagnetic interactions, but then this difference emerged when the universe cooled down and the uniform scalar field appeared everywhere. At the first glance, this theory seemed to be too exotic. We developed it in 1972, but for two years nobody believed us. People were laughing and asking where is temperature in the Lagrangian. But in 1974 Weinberg, Dolan and Jackiw confirmed our main conclusions and developed this theory in a more detailed way.

I still remember the seminar at the Lebedev Institute back in 1972, when Kirzhnits gave the first talk on the theory of the cosmological phase transitions. I was watching from aside. When Kirzhnits mentioned that he works on this problem in collaboration with Linde, a beautiful woman nearby asked: “Who is Linde?” Her name was Renata Kallosh, she was a rising star of theoretical physics, one of the first to complete the proof of renormalizability of the electroweak theory, following the groundbreaking paper by ‘t Hooft.

I asked her for a permission to follow her scientific discussions with others. They were well above my level of competence, but I was hungry for knowledge. And did I mention that she was beautiful? Two years later I met her at the lake Ladoga. For three days I was singing songs and reading her poetry of Russian poets who perished at the Stalinist times. Their poetry was still forbidden in Russia, but I was secretly copying it and learning it by heart. When I was leaving Ladoga, I kept Renata’s hand in mine just a second longer than I was supposed to. Few months later we married. This was the single most important thing that happened to me in my life. Our son Dimitri was born in 1975, and our son Alex was born in 1978.

Meanwhile our work on the cosmological phase transitions continued. In 1974-1976 we found that symmetry breaking between different interactions may occur discontinuously, as in the first-order phase transitions. When the universe cools down, the scalar field at first appears only
inside separate expanding bubbles, resembling bubbles of vapor in boiling water. Eventually these bubbles collide, merge, and the scalar field penetrates everywhere. Sometimes formation of bubbles happens with a large delay (supercooling). If the delay is sufficiently long, the universe during that time expands exponentially, remaining in an energetic vacuum-like state (false vacuum). In 1978, Gennady Chibisov and I studied this process and concluded that the colliding bubbles make the universe too inhomogeneous, so we did not pursue this idea any further.

In 1980 Alan Guth studied the same process, but he made an all-important additional step: He suggested to use a prolonged stage of exponential expansion, which he called “inflation,” for explaining why our universe is so large and uniform. He noticed the same problem that Chibisov and I stumbled upon: After the bubble wall collisions, the universe becomes very inhomogeneous. However, the possibility to solve several cosmological problems in one fell swoop was incredibly exciting. In the end of the paper, he exclaimed: “I am publishing this paper in the hope that it will highlight the existence of these problems and encourage others to find some way to avoid the undesirable features of the inflationary scenario.”

For about a year, many scientists, including Alan Guth and Stephen Hawking, were trying to find a solution of this problem, and concluded that it was impossible. But in Summer 1981, I realized that in a certain class of theories, the initial value of the scalar field inside each bubble was small and was growing very slowly. For a while, the state inside each bubble did not differ much from the original false vacuum state, and the interior of each bubble continued growing exponentially. If this stage is long enough, each bubble becomes exponentially large, larger than the part of the universe that we can see at present. An interior part of each bubble becomes homogeneous, and even if it collides with other bubbles, we will not see it because it happens exponentially far away from us.

The problem was solved. It was late at night, my wife and children were already sleeping, but I could not contain my excitement. I woke up Renata and told her: “I think that I know how the universe was born.”

I called this scenario “new inflation,” which emphasized its relation to the idea of Alan Guth, as well as the differences, some of which were quite significant. Most importantly, in the new scenario, inflation continued while the scalar field was slowly rolling down. This stage was crucial not only for solving the homogeneity problem, but also for production of tiny perturbations responsible for galaxy formation. The theory of these perturbations was originally developed in 1981 by Chibisov and Mukhanov in the context of the Starobinsky model, but the basic idea was quite general. In application to the slow-roll inflation, this theory implied that the amplitude of perturbations is inversely proportional to the speed of the motion of the scalar field. This was yet another way to see why the motion of the scalar field in the new scenario was so important.

I wrote a paper about it in Summer 1981, but I could not publish it in an international journal without getting a permission, which took about three months. In October, I reported my results at the international conference on quantum gravity in Moscow. Stephen Hawking was at my talk. Next day he gave a talk at the Sternberg Astronomy Institute, and I was asked to translate. His talk was devoted to the problems of old inflation. In the middle of his talk, Stephen said that Andrei Linde suggested an interesting way to solve these problems, and I happily translated. But then he said that my scenario also did not work, and for half an hour I was translating to everyone why my idea was wrong. But in the end of his talk I said that I disagree and explained why. We continued debating after his talk, then he invited me to his hotel, we continued there, then he started showing me photos of his family, and we became friends. I submitted my paper to Physics Letters, and I sent my preprints to many people working on similar issues. Three months later, a
paper with a very similar content and with a reference to my prior work was issued by Albrecht and Steinhardt. We were off to the races.

But new inflation suffered from its own problems. In Spring of 1982, at the conference in Tartu, Estonia, Starobinsky announced that density perturbations in new inflation were too large. Shortly after that, there was a conference in Cambridge organized by Hawking. In the beginning, some of its participants claimed that density perturbations were too small, but the final conclusion was that they were way too large. We left the conference with a hope that this is just a temporary glitch. However, for a long time there was no much progress in this direction. One could make perturbations small enough by assuming that the scalar field responsible for inflation was nearly decoupled from itself and other particles and fields. But if it is decoupled, how did it come to a state of thermal equilibrium required for the cosmological phase transitions?

It took me a year to find a solution of this problem, and it was paradoxically simple. I found that inflation can happen in a much, much broader class of theories than the theories where new inflation was possible. It can happen even in the simplest theory of the scalar field, similar to the theory of a harmonic oscillator. It can happen even if there was no hot Big Bang. If the scalar field initially was large, then the universe experiences a long stage of inflation. But why would it be large? Well, why not? If it was small, it did not inflate, so it remained small and unsuitable for life. But if the field was large, then the universe experienced a prolonged stage of inflation, became large and observers like us could live there. And if the universe consisted of a chaotic patchwork of different parts, some with a small field and some with a large field, the parts with a small field remained tiny and irrelevant, whereas the parts with a large field became huge and uniform. Incredible! Usually it is so easy to make chaos from order (just look at my office, or better yet at the office of Alan Guth), but now we can get order from chaos, on a cosmological scale! I called it “chaotic inflation.”

The basic principles of chaotic inflation are incorporated now in most of the realistic inflationary models, including the model proposed by Alexei Starobinsky in 1979-1980 even before the old inflationary model by Guth. The original version of the Starobinsky model, however, did not attempt to solve the flatness and homogeneity problems, which was the trademark of inflationary cosmology. This changed in 1983-1985, when this model was slightly modified and reformulated along the lines of chaotic inflation. I thought that inflationary theory is basically complete, so it is good time to summarize our knowledge and write a book about inflation. Nothing prepared me to the next twist of the road.

These were the early years of “perestroika” in Russia. One of the decisions made by the government was to improve the way we were getting permissions for publication of our results. The idea was great, the old cumbersome system was eliminated, but... the new system was not established. For almost a year we could not publish our papers abroad; we were living with our mouths shut. Writing the book on inflation did not help much. It was not interesting to repeat for the second time the same things that one could find in the original papers. Step by step, I plunged into a state of depression. All doctors told me that I am fine, but I was feeling awful. And then, in Spring 1986, something unexpected happened.

I received a call from my institute saying that I must urgently go to Italy to give popular lectures on astrophysics. Usually we would need to make a major effort to go abroad, but now, for the first time in my life, they themselves wanted me to go, just at the time when I could barely stand up from my bed. I told them that I cannot, I am ill. But it was about Russian-Italian friendship, decided at a very high level, I should go, or else!... In a record short time I prepared all paperwork required for the trip, including a certificate that I am perfectly healthy. I was in bed
for two days, recovering from this effort, when I received another phone call. Yes, my documents are received, yes, I will go to Italy, but Italians want the text of my lectures to be distributed in advance. When do they need it? Better tomorrow.

It was late in the evening, I was in a really bad shape, but suddenly I realized that if I write something within the next half an hour, my new paper would go out tomorrow, by diplomatic mail, without any permissions, ending this period of silence. This was crazy, impossible, but it was equally crazy to miss this opportunity. But what can I do within half an hour? What can I do? And half an hour later I invented the theory of eternal chaotic inflation.

Back in 1980, Alan Guth found that inflation does not end in all space. There are some parts of space which continue inflating. This was one of the problems of old inflation. In 1982-1983 Steinhardt, Vilenkin and I realized that something similar happens in new inflation as well. For the next 3 years, none of us returned to this possibility, in part because of the demise of old and new inflation.

What I have found in 1986 was similar, but much more general, being valid in a broad class of models of chaotic inflation: In some parts of the universe, quantum fluctuations may locally increase the energy density of the scalar field. The probability of such events is very small, but each such part expands faster than its neighbors, it becomes exponentially large and, in its turn, produces new parts of the universe. Inflationary universe enters the eternal regime of self-reproduction.

This process produces many copies of the same universe, but also many exponentially large parts of the universe with different values of various scalar fields in each of them. Scalar fields determine masses of particles and laws of their interaction with each other. As a result, the universe becomes a multiverse, an eternally growing fractal consisting of exponentially many exponentially large parts with different laws of low-energy physics operating in each of them. These parts are so large that for all practical purposes they look like separate universes. One may use this scenario to make sense out of the cosmological anthropic principle: we can live only in those universes where the laws of physics allow our existence. The most powerful realization of this idea could be achieved in string theory, where the total number of different vacuum states in different parts of the multiverse could be enormously large.

Suddenly all difference pieces of my knowledge about inflation have fallen into proper places; it was one of the greatest emotional shocks of my life. I could not write about it that night, but a month later, when I was in Italy, I had three papers on eternal inflation in my backpack. When I returned to Moscow, I continued writing one paper after another on these issues, and totally re-written my book on inflation. This field greatly benefited from the heroic efforts of Alex Vilenkin, John Barrow, Martin Rees, Steven Weinberg and several other people bravely working on related problems at the time when work on the anthropic principle could easily damage even a well established scientific reputation. The time for a broad acceptance of this scenario was not ripe yet. This happened only 17 years later, in 2003.

In the meantime, our life changed in an unexpected way. Perestroika actually worked, at least in some respects. In 1989 our family was allowed to go to CERN for a year. We were sure that in 1990 we will be back in Russia, but instead of that Renata and I became Professors of Physics at Stanford university. At Stanford, I continued to work on eternal inflation, but I also invented a new version of inflationary theory, called hybrid inflation. Together with Lev Kofman and Alexei Starobinsky, we developed the theory of creation of matter after inflation.

In my early work, I often concentrated on problems that I could easily understand and visualize.
Fortunately, the first steps in the development of inflationary cosmology were basically very simple, from the technical standpoint. The idea to solve many cosmological problems by the stage of inflation was simple, the idea that one can have inflation inside each bubble was simple, the idea that one does not need the standard assumption of the hot big bang, phase transitions and supercooling to achieve inflation was also very simple, and the simplest model of chaotic inflation was as simple as the theory of a harmonic oscillator. The main difficulty here was psychological. At each step, it was necessary to give up some of the well established principles of the previously accepted cosmological paradigm, and propose something else instead. That was really hard, but also most exciting.

However, at the new, more advanced stage of the development of inflationary theory, one could not reach substantial progress without venturing into many different fields, some of which were not quite familiar to me. Stanford Institute for Theoretical Physics provided a perfect environment for doing it.

The end of the 20th century witnessed a groundbreaking discovery that the vacuum energy is extremely small but different from zero. This result, which was first obtained by observations of supernova and then firmly established by a combination of many different cosmological observations, did not match the standard theoretical expectations. There were some important hints, due to Bousso and Polchinski, that one could explain it in the context of string theory with many different metastable vacuum states. But despite tremendous progress in string theory, we did not have any reliable mechanism that would assure stability or metastability of stringy vacua. And it was especially difficult to stabilize string theory vacua with positive vacuum energy, as required by observations.

Here the possibility to collaborate with the best people at Stanford and beyond was absolutely crucial. In 2003, Kallosh, Kachru, Trivedi and I found a possible way to stabilize stringy vacua, building upon the previous works by Giddings, Kachru, Polchinski, Silverstein and others. It became known as the KKLT construction. Soon after that, Douglas made an estimate of the total number of different ways one can do it. His results indicated that the universe described by string theory can be in $10^{500}$ different states. Then Susskind brought it all together into the scenario which he called “string theory landscape.” Different parts of the universe can be in different vacuum states, converting into each other due to quantum fluctuations, and growing exponentially due to inflation. This was very similar to what I anticipated back in 1986. Inflationary multiverse, string theory and the cosmological anthropic principle became parts of the same package.

This grand vision is not free of conceptual problems stemming from the seemingly unlimited number of new possibilities to be explored. We need to learn how to make reliable predictions in the context of the new cosmological paradigm. But first of all, we must be sure that we are on the right track, that the basic principles of inflationary cosmology can survive the strict tests provided by cosmological observations. Moreover, we need to develop inflationary models in the context of the best presently available theories of all fundamental interactions.

I am extremely lucky in this respect, since Renata is one of the top experts in supergravity and string theory. We collaborate intensely, stimulated by recent cosmological observations by WMAP, Planck and BICEP2. Hundreds of other people work on closely related problems. We live in the age of great cosmological discoveries accompanied by the unprecedented advances in understanding of the fundamental laws of physics. It is a privilege to be surrounded by people who, by their combined efforts, reveal the secrets of Nature which we could not even dream about few decades ago.