13. The Cosmic background radiation

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One of the most important and convincing proofs for a Big Bang as the beginning of our universe is the discovery of cosmic background radiation. This radiation is measured uniformly from all directions, with the same intensity distribution and fulfils our entire universe. No matter in which direction we look, the space is traversed by a radiation that not only seems to come isotropic from all directions in the same way, but which also fits perfectly into the spectrum of a black body, whose maximum radiant power lies at a wavelength of λ = 0.102cm. According to the Wien´s Displacement Law it can be calculated into a temperature of 2.725 ± 0.002Kelvin.

The vacuum is therefore not 0 K cold, but contains residual heat in form of radiation, which is left over from the time comparatively shortly after the Big Bang. 412 quanta can be found in every cubic centimetre and that, it is assumed, everywhere in the universe. Microwaves that are still present from the initial amount of radiation shortly before the universe became transparent. According to theory, after the Big Bang and inflation, the particles which were caused by pure energy, cooled down more and more, because the space between got bigger and bigger. The amount of energy produced in the smallest space, the energy density, decreased, but not because energy flowed into a still empty space as in an explosion, no, according to the theory space was first created and then this space expanded and thus the density of energy decreased in general. During the inflation by many orders of magnitude and afterwards continuously according to the known physical laws.

Space, more precisely an expanding space-time, seems to be Euclidean and exactly flat today. Neither does it bend too much, which would prevent the formation of structures, nor does it expands too much fast, which would cause too many and too small structures. In order to obtain a state in which structures such as galaxies, stars and planets can form right up to humans, the initial conditions would have to be exact to 10^{57} digits. Or one postulates in addition an inflation, which the universe in tiny fractions of a second, exponentially inflated by many orders of magnitude and thus oppressed the curvature factor in the Friedman equations. Each initial state then always leads via inflation to a curvature of k=0, i.e. an exactly flat universe. The discovery of the Higgs particle, which is interpreted as boson of a scalar energy field, makes it possible to accept this repulsive scalar field as the driving force for inflation. It would then correspond to Einstein's constant or a dark energy that drives the universe, makes it diverge. However, this energy field would have had to be greater by a factor of 10^{120} times than the current value.

According to the theories, space should expand together with time itself and not particles into an empty space. Here, however, one wonders how space can first only stretch and then become usable. Either the space with all elementary structures expands, than the particles in it do not notice the difference at all, only someone in outside the universe or a room is formed completely new, is created in the first place. Then, however, it has not stretched, but has emerged and a photon in it would have to travel a longer distance, but would still have the same colour. It would not be red shifted. The argument is that the expansion of space is only noticeable at really large distances, so in areas between galaxies, galaxy clusters and the voids - the big voids in between. In the micro range the connections are determined by electrical interaction forces and by quantized effects. Here the expansion of the space plays no role. And yet there remains uneasiness. Why should the equations of space and time of the theory of relativity not apply in the micro range?

Finally, they are also used without hesitation in extreme mass accumulations, such as black holes, although here matter passes too densely, space too small and time too strongly changed. Only the laws of quantum mechanics should still apply here. The same applies to the Big Bang, where space and time temporarily even increase in an inflationary way, quasi explode in an over-expansion. Also here the distances of the particles and photons is the energy density so of all familiar sizes contradicting high, that then the expansion of the space-time or an expansion-determining scale size, in the same way should not have an effect. With these initial conditions, the Universe should only be determined by quantum mechanical parameters. The theory of relativity would then only come into effect much later.

Since we clearly observe a redshift of the line spectra and measure an isotropic microwave radiation that fits exactly to a blackbody radiation, we assume that light particles of the background radiation we receive today, were originally generated at a much higher temperature. The light from the background radiation is not discrete radiation, but was generated by colliding charged particles. This led to permanent braking radiation. Plasma was originally much hotter than 3000 K and radiation was still dominated. There were incessantly produced quantum and destroyed again, so that there were considerably more photons than particles. The small universe was so hot and densely filled with particles and photons that it was still invisible. Only when at about 3000 K the electrons were colder and thus slow enough to merge with a proton, the neutral atoms formed in this way produced photons much less frequently and the universe slowly became transparent.

Energy is needed to expand space itself. In this case energy that repels the large mass systems. The energy content of a universe 380,000 years after the Big Bang and a universe 1089 times larger corresponds to the amount of energy needed to remove the masses in it from each other against gravitational attraction. It is greater in amount than all known baryonic matter and far larger than speculative dark matter. What drives this energy, where it comes from is completely mysterious.

If we had to deal with a primordial force that is released once in the universe as in an explosion, and tears it apart, then depending on the amount of energy, the masses would first expand and move away, and then slowed down again by gravity, to collapse again at some point. Also in the Big Bang model, to which the Friedmann equations are applied, masses move apart, but now not as in an explosion from a centre. But the space, the space-time or a general scale size between the masses stretches and drives the galaxies before it. Here too, energy was uniquely released in the Big Bang. This energy, which is reflected in a spatial expansion, is then consumed as the size of the space increases. In the same way gravity, if the masses are large enough, would eventually get the upper hand and reverse the process.

A static universe would not be conceivable, but neither would a universe that expands ever faster. According to Einstein's equations, a static or an accelerated universe would only be possible with an additional constant or a scalar energy field, for example the Higgs field, to reconcile the two. This constant or this field would have been then something of an energy density that is repulsive. According to the Big Bang theory, when we look into the universe we can only look back into our past. But it turns out that a model that takes dark energy into account does not increase linearly, but also moved in the past on a curve in which spatial expansion accelerated. Then we get a model that fits the idea of dark matter and dark energy in a Euclidean flat universe. In which not only do the observations predominantly agree with the model, but in which one can also rely on Einstein's field equations. But it requires, as mentioned, either a fine tuning of the initial parameters with an accuracy of 10^{57} digits, or inflation that expanded the universe by a factor of at least 10^{26}. This requires its own mass-repelling energy field, as the cosmological constant suggests. But today's value is of the cosmological constants are 120 orders of magnitude too small.

What does the structure of the universe look like in our imagination?

The background radiation is well documented, so as the decisive observable quantity, it must be explainable in every universe model. We have postulated that particles in our model do not arise hot from radiation that condenses with falling temperature, but separate from infinity directly at the edge of the universe and there initially dormant. They bring the energy stored in them with them. With the moving universe edge, first the number of possible states for the resting remaining particles increases. Then the particles occupy the growing possibilities out of themselves. So over a long period of time, they take up motion very slowly until two particles come close enough to touch each other.

They make a first contact. Than they suddenly feel a strong foreign, repelling electric force which drives the particles away from each other at a speed close to the speed of light. Now they hit more and more stationary particles, which are all set in motion at high speed. This networking grows bit by bit and the particles become slower and slower. Such an initial movement at almost the speed of light cannot be equated with our form of kinetic energy. A particle that is not cross-linked and is still almost inertia-free does not have the same effect as a particle with a large inert mass or high process time density. Kinetic energy is composed of velocity and an inert mass. It is the energy of an inertly moving particle. Apart from that, a particle always jumps quantized, without gap, from one place to another. We assign to it, from our world view and our understanding of time, a movement pattern that allows developing a movement out of the network. For us, a space must be crossed. If this networking does not exist as well, then these leaps in movement have no meaning, no effect on our world.

Let us argue further that inertia and thus the connection to other particles grow over time, matter will slowly gain worldly energy or energy for the whole, for our physical world. Thereby additional energy out of nowhere shall not be, therefore the particle must draw its energy from its mass according to $E = mc^2$. Further we have determined that the levels move away with each contact around a small δ piece. They move away from each other and lose a tiny amount of energy each time, stored potential energy of the levels in relation to each other. Their initial, borderline high, uncross-linked speed decreases, at the same time their whereabouts decrease also with each contact. This probability of residence is the actual, physically important quantity for us. It indicates how old a particle is or how deeply rooted it is with the rest of the world. If the spatial blur is small, then we are dealing with old matter. The energy is strong in the system as a whole and a little less in the particle, it becomes minimally lighter. So time consumes particle energy, which is expressed in a smaller local blur. Originally the particle moves with speed of light, but this movement is more of a mathematically statistical form. For us, the inertial moving mass associated with the kinetic energy is initially almost zero and gains slowly energy, which then shows its effect on the world.

Our first particles are neutrons. The proton is initially trapped between the planes of the electron. Thus we have two particle planes in the neutron, which can also exist independently of each other. Two planes cannot be separated, but two independent pairs of planes with different plane distances can. For both, the process time increases equally via external collisions, but an increasingly flowing time does not have the same effect on both particles. The proton gains more inert energy than the electron, but moves more slowly. The inner particle with the smaller plane distance has more of that, what we imagine as a physical mass. So let us assume that the same processes that lead to the decay of a free neutron into an electron and a proton after about 15 minutes also lead to a separation of the newly formed particles in our environment via the β-decay. The proton gains energy faster with each contact than the electron and can overcome the electrical potential under favourable conditions. The right energy value alone is not enough, the direction and how often the connection consists of the right direction also plays a role. Probably the actual difference, in the beta decay between here and the neutrons more towards the edge, lies in the time expansion, which increases further to the outside. Decay would then, from our point of view, take much longer towards the edge than it would in our case.

Once electron and proton have separated from each other, their process times are also separated. The two charged particles now move on separately from each other at high speed and build up different networks. The charges then move freely in space with increasing inertial energy. They both generate a large number of photons of blackbody radiation.

If the beta decay process is similar to ours, the particles both have a very high physical energy, which was released during the separation. However, due to the time expansion, the values are in our view in the range of a few Kelvin, which is many thousand Kelvin there. For us outside observers the inertial energy changes now. The further away the edge is, the more the time expansion decreases, but the experiencing of the particles there runs locally unobtrusively. The processes when looking into the universe seem, for observers there, to pass faster and faster the further one looks inside. Towards the inside, everything is blue-shifted to the outside red and there is no shift to the sides. After a certain time after the formation we have protons, electrons, neutrons and also neutron compounds, if two moving neutrons meet, which have not decayed before. We still have high motions of weakly cross-linked particles that can hit particles that have already decayed considerably more are networked. Over time, equilibrium will increasingly develop in favour of inert, cross-linked energy, but the fast neutral particles still play a major role because they can form connections. Fast neutrons can collide and network with each other. Under favourable conditions, however, they can also collide in such a way as to form compounds of several neutrons or of neutrons and protons. In this initial state, hydrogen, deuterium and tritium nuclei or even higher atomic nuclei such as helium nuclei may be built. They are all charged charge carriers that continuously generate braking radiation and cool down a little each time until they capture more and more free electrons at about 2.7 K and together become neutral atoms. 2.7 K is there from the experience, like 3000 K with us. The number of the neutral atoms increases and in the same measure more and more photons can migrate and are no longer captured by charges. The universe becomes increasingly transparent and the last generated photons penetrate the free neutral space inside.

The decrease of the time strain does not have a local effect on the atoms. We would only observe that from our point of view, i.e. also for our calculations, for example the neutron decay proceeds faster and faster the further away the edge is. Atoms gain increasingly sluggish energy, however only in relation to the whole, suburb one feels nothing of it. Here the first, fast, uncross-linked particles seem to come out of nowhere. But once they have had contact, the further development remains stored and is redeemed again and again. Here outside, everything still develops in a completely new way. Only slowly does the eye open for the whole. Things still seem to be free and the further possibilities still seems to be open. Much later in the life of the particle, every change of motion is subject to an agreement with all known contacts, all of which have a potential influence on its development. Now the movement is determined by the whole.

According to the Big Bang model, the spatial expansion was counted back and the redshift from the 2.7 K of microwave radiation received today to about 3000 K, the temperature that the photons originally had, was calculated. It was the time when the electrons had lost enough energy to be captured by the protons. The particles lost energy because space absorbed energy, the space expanded. Here it is not clear where this energy and the driving force for the repulsion came from. In our model, the elementary particles continually gain worldly energy from the plane shift at each contact. The temperature of free particles increases continuously with time or age. At the beginning it was almost zero Kelvin, after recombination it was about 2.7 K and today one could compare the motion of such particles with temperatures of 3000 K, if it had not come to large transformation processes. But what is visible and tantamount to an increasing temperature or energy increase is the process time, which is reflected in the redshift. The process time increases more and more the older a particle is. It can be slowed down by high velocities or very large masses. This means that it can lose connections, but if you move away from the mass concentrations or slow down the body, it gains as many processes as it was cut off before. It seems that time is a very fundamental process variable. If we seriously compare it with the course of elementary processes, then we could deduce from our experience to systems, where time passes more slowly for some reason.

So if it really is not the space or some scale factor that is stretching, but it is the time that continuously slows down towards the edge of the universe, then we could transfer the processes here from our realm of experience to temporally stretched places. If a fast electron, which slowly loses energy, recombines at a temperature of 3000 K, then such an electron, at which the time is stretched 1089 times, would combine at 2.7 K with the lighter proton there to form a neutral atom. In our universe structure there is already a shallow Space geometry, it doesn't have to be explained by inflation first. Our world does not create incomprehensibly large values of particles in far too small a space, with all the problems resulting from it. Particles do not form once, but continuously at the edge, which leads over the long period of time also to such an enormous total number, as we observe them. Particles are formed that have a solid plane structure and are initially cold. Then they take on more and more free states until they touch each other and suddenly move at high speeds. This first contact of a first pair of particles will take a very long time and will occur relatively simultaneously at great distances from each other. Such first, few particle contacts, which then can contacts much faster, with the speed of light further particles, can be the germs of later large mass accumulations, the preforms of suns or even of galaxies. The first internal energy transformation concerns the increasing cross-linking. It makes the particles a little lighter, but creates a connection with each contact, which is stored.

Finally, we have a first primal condition in which there are free protons and electrons that continuously produce photons, but also smaller and larger neutron compounds, as well as neutrons and proton compounds. The original state loses energy due to the many photons that also escape inward into the universe. At a temperature of 3000 K, i.e. a radiation temperature observable for us at 2.7 K due to time expansion, the electrons are slow enough to be captured.

The universe then becomes transparent, but also dark for a long time. Since the universe is constantly enlarging and is constantly producing new particles that are going through the same process, we are still receiving the same microwave radiation from all directions - the same radiation and with approximately the same intensity. And also the later development of the structures then takes roughly the same course in all directions.