

We see stars at the sky, embedded in unlimited space.

In our universe, we discover, photograph and explain a lot by ourselves. With a telescope of length 1 m we take photos of objects near the end of the visible universe. So we observe satellites, comets, protuberances, the formation or explosion of stars, galaxies, curvature of spacetime and signs of the Big Bang. How can we understand all that?

Using basic experiments, we obtain the fundamental laws of nature including their universal constants:

the universal law of gravitation with the gravitational constant G ,

thermodynamics with the Boltzmann constant k_B ,

the theory of relativity with the velocity of light c and

quantum physics with the Planck constant h .

With it we explain the history of the universe. Moreover, we resolve the following mysteries:

The cover shows the expansion of the space. We derive that macroscopic dynamics from the microscopic dynamics, and with it we show that the space is flat globally. The cover indicates a very rapid enlargement in the early universe, we explain it by a cosmic unfolding of space.

The masses in our daily world originate from the energy of electromagnetic waves, as illustrated at the cover. What is the source of that energy of radiation? For an analysis, we calculate the time evolution of the actual light horizon backwards in time, until we arrive at the smallest possible length, the Planck length. At that length, the omnipresent quantum fluctuations exhibit a huge zero-point energy, ZPE, in their local frame. This ZPE transforms to the available energy of radiation in the process of cosmic unfolding, as can be seen at the cover. In this manner we derive the origin of all mass and energy in the universe, and we achieve precise accordance with observation. On that basis, we can resolve even more mysteries...

We are classes from grade 10 or higher, courses, enthusiasts, friends of experiments, natural scientists ...

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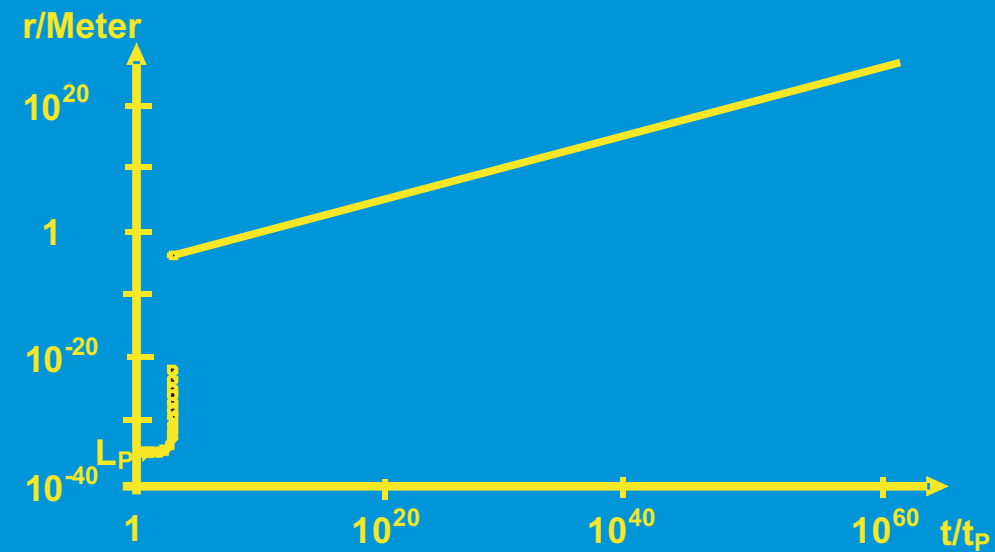
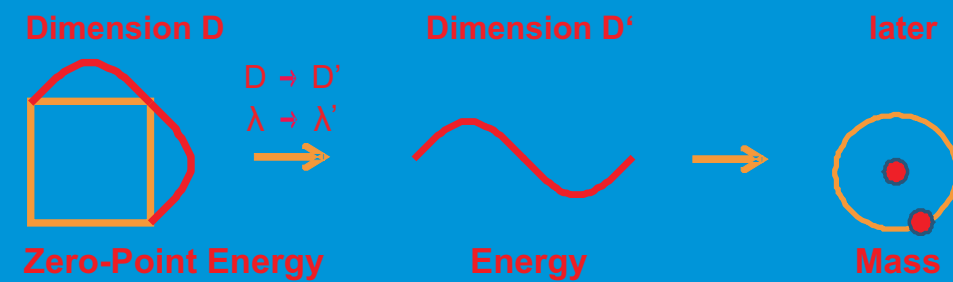
3

H.-O. Carmesin Universe Developing Discovered by Making Photos, Experiments and Calculations



The Universe Developing from Zero-Point Energy Discovered by Making Photos, Experiments and Calculations

Hans-Otto Carmesin



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Reihe
Universe: Unified from
Microcosm to Macrocosm