Considerations on the subject of chaos

A few phrases at the beginning

…in the beginning was chaos …. from chaos arose order ….. or chaos is the basis for the principle of self-organization which explains the present universe with its complex structures … etc.

Self-organization theory – the reciprocal movements of a complex system controlled by the laws of non-equilibrium thermodynamics. According to this theory, the system can "spontaneously" organize itself if energy flows through it. In other words, if we have energy differences and a chaotic system among them, and we start the energy flow given by energy differences, then the initially chaotic system will start to organize itself into higher orderly predictive complex structures. This is verified many times not only in thermodynamics, physics, but also in chemistry or biology. **The proven theory in practice many times.** But it adds more questions to the origins of life and the origins of the universe than it explains them. On the one hand, the requirement of an energy differences. Secondly, an impulse triggering the flow of energy. Furthermore, the regulation of the flow of energy and, above all, the origin of energy, or what we call energy.

It is very unpleasant to expect chaos to infinity. See an image below.

Chaos everywhere. It doesn't matter if the chaos of thermal or vacuum fluctuations. There is a contradiction. But what is valid for a finite, however large, number of particles and boundary conditions may not be valid for an infinite number of particles. Especially for indefinable fluctuations of the quantum field. There are already contradictions in chaos that do not cancel out in its application to the infinite, infinite expanse of chaotic behavior - fluctuations, gas molecules, etc. Chaos, chaotic fluctuations cannot be stable, they must move, or they must arise and disappear, there must be mutual collisions, mutual interaction. This is a question of further research, or considerations based on detailed observations on the basis of derived base units. Not to mention the necessary and unquestionable existence of at least two different chaotic environments - the basis of thermodynamics.

The question of what is beyond chaos is meaningless. It doesn't make sense in the view of derived units from regular appearances modulated on chaotic fluctuations. Just like asking what's outside the universe. The universe and its internal parts, including the chosen units, behave as they do. There is no external observer, only internal observers with internal relationships. The question of the outside is not a matter of science, but a matter of Faith - and that is another topic.

What is the meaning of chaos? How can chaos exist? Where did chaos come from?

Chaos can´t exist by itself, by its inner power, by its nature. It can´t hold together by its own properties. Chaos cannot sustain itself in chaotic behavior. Chaos must be sustained, allowed to behave chaotically. Firstly - to be in motion and secondly to be limited from the outside or inside. Without allowed motion and limiting conditions, the chaotic particles (waves) would collapse in themselves. Or they would have drifted apart indefinitely. Very roughly - See particles of gas. These particles must be in motion and to be limited in closed space or limited

by gravitational field. The gas molecules would either collapse into each other or move away from each other.

The gas is defined as the collection of particles (waves) as such exists only in closed space or with gravity forces. Without gravity forces or without closed space there is no gas as we understand it – colliding particles. To stretch the space infinitely – there are no collisions, no gas, no random fluctuations, no chaotic behaviour. Chaos without collisions is not the chaos. Collisions are given by external forces – gravity or closed space like vessels or anything else. *We quietly postulate this, but it's important to think about it in more detail.* **Without a closed space or gravity forces, there is not only no gas, but there is no chance to condense into a liquid or solidify into a solid.** See phase transitions.
Chaotic behaviour needs bounds. Chaos needs boundary conditions. Without bonds, without boundary conditions there is no chaos, no chaotic behaviour.

Two conditions defined the chaotic behaviour of gas
1) the limited space
2) the motion of parts.

The gas need limits – without limits gas could not exist There must be limits for interaction - reciprocal collisions among particles of gas.

It is very difficult, if not impossible, to apply partial knowledge of the classical behaviour of gases to an unlimited number of particles, waves or various fluctuations.

The situation with the chaotic behaviour not only of the gas but also of the quantum fluctuations is similar to the probability calculus. Particles with no external limits would expand to infinity. Thus, there is no chance of at least two particles meeting. Likewise in probability - there must be limits (edges of the dice, sides of the coin, given possibilities, etc.). If there were no limits we cannot evaluate probability. It is hard to calculate the probability of one hard-to-differentiate event out of an infinity of possibilities of hard-to-differentiate events. However, we know that when we look more closely we discover still new details, and likewise when we go the other way, to a great distance - still new and different structures.

How to cancel chaotic behaviour? How to cancel gas properties? Very easy. Put the gas into closed box. After that let´s fly to intergalactic space. Open the box and all chaotic behaviour will be over. Gas will not exist from this moment. But each particles of the gas had some movement? The movement didn´t dissappear. The particles are free to move freely through space, each in the direction it had after leaving the box. At some distance from the box, the particles will occasionally collide, but at multiples of the distance from the box, each particle will fly to its own side without ever colliding with another particle. Until particles reach the nearest galaxy with their stars and planets.
On the other hand we can cancell the chaotic behaviour if we reduced the particle speed to zero then particles would collapse in themselves.

Go on! Imagine only particles in closed box in empty space (without galaxies) – imagine material particles of chaotic gas motion. Every particle has its own mass. Every particle

weighs something. We will open the box and what will happen? The particles are free to move freely through space, each in the direction it had after leaving the box. But we are in the empty space without galaxies. In other words, the particles fly into free space and **if their velocity is less than the escape velocity** they collide again at the starting point. But the gas will no longer exist. The particles will be motionless together, at most oscillating due to internal atomic motions.

If their velocity is greater than the escape velocity, then the particles will move away to "infinity". But we already know from inertia and spacetime that the slightest matter deforms spacetime. In short, the free particles will move for a long time through the gently deformed spacetime until they come together again at another place - after many orbits of the curves of the deformed spacetime.

Imagine our universe which is filled by moving particles. Every particle has its own mass. These particles interacts with each other by collisions among them. They are attracted to each other, but they will never be away from each other. The range of their appearance defines the dimension of the universe. It doesn't have to be just particles, but perhaps the basic vacuum fluctuations of the quantum field.

Let's try the following suggestion - in the beginning of the universe there was no chaos. In the beginning there were primordial origins of boundary conditions. ***The result of boundary conditions is the chaotic behaviour of everything inside the boundary conditions. Not mention wildly „bubbling“ quantum fluctuations.***
It is impossible for ours (humans) to explain the subject of primordial origins of bounding conditions (gravity, closed space) by derived thermodynamical equations describing behaviour of bounded chaotic gas which depends on upper mentioned bounding conditions.

If the chaos can´t support itself then the chaos is unable to form itself to higher structures. Especially organized organism. The flow of energy through chaos doesn´t solve anything. See self-organization theory. We need chaos, resp. at least two different chaotic environments with the difference of an energy levels, after that there are some germs of organized structures.