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. Where there is a space for energy flow according to the so-called self-organization theory? Or the chaos can be spread out infinitely, but e.g. in one dimension, or in two or three or more dimensions. See a flexible rubber sheet membrane that is formed from the outside. Or else - one cannot speculate everything without experience, without measurement.

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, by limiting conditions from the outside. See particles of gas. These particles must be limited in closed space or limited by gravitational field. In the other hand particles of gas must be in constant motion.

Upper two conditions defined the chaotic behaviour of gas. The limited space and the motion (the change).

How to determine the gas? Firstly, the gas must be bound. By gravity or anything else – boxes, vessels. etc. Where did such boxes come from? *Imagine only the gas – how to form it into solids like boxes?*

The gas without bonds – such gas could not exist There must be bounds for interaction -- reciprocal collisions among particles of gas.

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.

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.

The universe must be limited and changeable, otherwise chaos could not exist. See condensation nuclei of clumps of matter.

Conclusion:

The gas 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.

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 and the difference of an energy levels, after that there are some germs of organized structures.