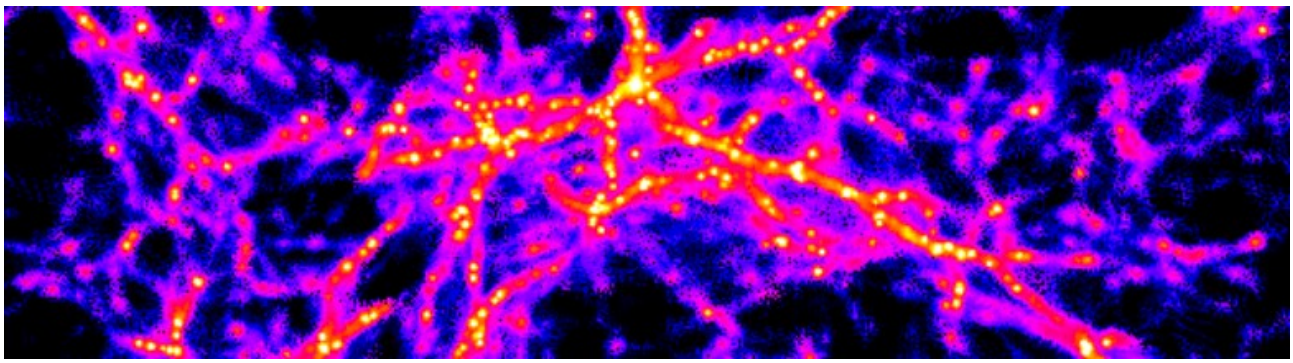


What does Entropy have to do with the Sun and Nuclear Fusion?

Mathias Hüfner 2026

Abstract: The text develops its own structure-based understanding of entropy as an ordering relation and connects it to questions of solar physics and nuclear fusion. The argument proceeds in three main steps: the redefinition of entropy via structural changes, the modeling of entropy changes through the decomposition or formation of building blocks, and the application of these ideas to the sun and the question of how nuclear fusion becomes possible.

These days, there's a lot of talk about matter, antimatter, and other related concepts without a clear understanding of their meaning. The idea that matter, philosophically speaking, encompasses everything that can be experienced outside of our consciousness, isn't really grasped, because then one would conclude that the concept of antimatter can only exist in our consciousness as something we've thought about, not in reality.

Matter can be perceived in four different states: solid, liquid, gaseous, and luminous. These states are generally clearly distinguishable from one another and can be perceived as structures, as illustrated in Figure 1 by a scaled matrix with differently colored cells. These cells represent the properties or micro-states of a partial volume of matter. The term "field" is also frequently used to describe a surface structure. We describe matter by linking its properties to concepts. This link is called a relation. Descriptions are therefore relative, and the science that deals with the fundamental properties of matter is physics. We owe the idea of the connection between observer and physical phenomenon to Albert Einstein's theory of relativity. However, the fundamental relation consists of a numerical value and a physical unit. The mathematization of physics has led to it rarely dealing with structural properties, but mostly only with quantities and their equality.

The question for physics, therefore, is: Can the degree of order be quantitatively described by an order relation? Doesn't an order relation also depend on the objects and the criteria by which one wants to order? The decisive criterion is the perceived difference between two entities. Differences can be counted. Ludwig Boltzmann and Claude Shannon provided different answers to this question by clarifying the concept of entropy, because entropy is more than diffuse disorder or the macroscopic ratio of heat quantity to temperature. Entropy is an order relation with respect to space and time. However, unlike the quantities of physics, entropy lacks a standard comparable to mass with which it can be quantitatively measured. A structure is recognized by its boundaries. There, the state of

matter changes. Boltzmann already had micro-states in mind when he formulated his structural formula. Based on changes in properties or micro-states, Shannon defined information in units of binary digits (bits). In contrast, in computer science, information scaling is specified in bits. This can easily lead to confusion.

1. Mathematical formalism for entropy

While textbooks treat entropy somewhat simply, we want to do justice to its spatial and temporal significance. Mathematically, it involves a change of a property or state as it moves through a unit of space. In Figure 1 we have two information matrices with a scale in 10^2 cells of four different properties. If we traverse the cells of the matrix row by row on the ordered left side, we obtain one bit information for each row and one bit for each column, because only changes to the cell contents contribute to a gain in information. On the unordered side, however, we obtain different bit counts for each row. If we imagine this three-dimensionally, then, in the depth of the figure, behind each cell of the information matrix, we have nine more covered cells that could potentially provide information at their cell boundaries. However, covered cells do not provide information, as only their surfaces are visible. A cube provides six surfaces, which can be counted in the same way.

While entropy has previously focused on diffuse disorder, here we obtain an entropy of structural possibilities through information by counting structural changes. However, structural changes are only perceived at the reflective surface. In a specific state, I can gain information from the six surfaces in the unit 'bit' by counting the changes at the cell boundaries in each column and row of my matter model. The coverings do not contribute to the information, as they are invisible. We will now describe the model mathematically.

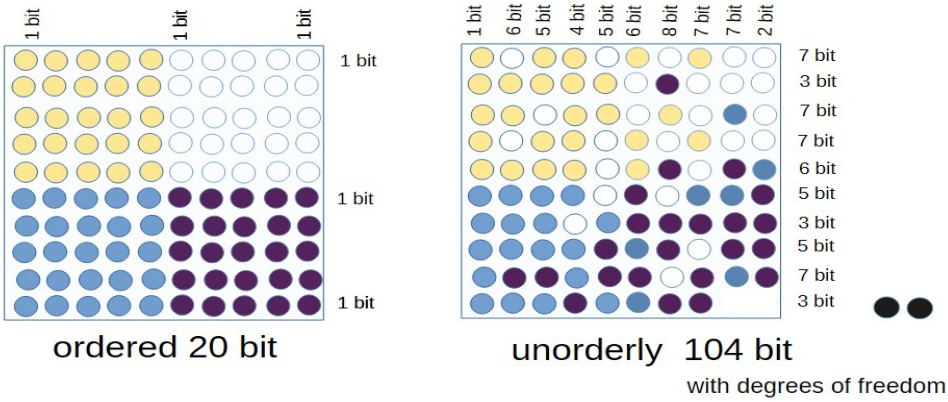


Figure 1: Structural order in a matrix field

Given;

- **A cube**: N^3 elements (N=10 in the figure 1) as information scaling
- **States:** Each element has one of q properties (e.g., 4 phases distinguished by color)
- **Measurement:** The cube has **6 visible faces**. Each face is an $N \times N$ grid.
- On each face, you consider all **rows and columns**.
- In each of these rows, you count the **changes** between adjacent elements. Each change corresponds to **1 bit of information** in the given model.
- Interior coverings ("invisible") are not counted.

Thus, the information is essentially proportional to the sum of all state changes observed along the rows and columns of the six surfaces. From this, a general formula for the structural changes along the path through the rows and columns of the cube's surface matrix can be derived.

Take a line (e.g., a row) of length N with states $x_1,x_2,\ldots,x_N$, $x_i \in \{1,\ldots,q\}$ and

define the **change function** between adjacent cells: $\delta(x_i, x_{i+1}) = \begin{cases} 1, if\ x_i \neq x_{i+1} \\ 0, if\ x_i = x_{i+1} \end{cases}$

Then the information (in bits) for this one line is:

$$L_{Zeile} = \sum_{i=1}^{N-1} \delta(x_i, x_{i+1})$$

This is precisely the information about how often the state changes along a row. The same formula is obtained by writing the change function for the columns, only the index i becomes the index j. We can then calculate the total information on a cube face. The face has N rows and N columns, for a total of $2N$ lines. Let a face be described, for example, by $x_{i,j}$, where $i,j=1,\ldots, N$.

Then the following applies:

- **Rows:** for each fixed row j, the sequence $x_{1,j}$, $x_{2,j},\ldots,x_{N,j}$
- **Columns:** for each fixed column i, the sequence $x_{i,1},x_{i,2},\ldots,x_{i,N}$

The information on a surface is: $I_{Fläche} = \sum_{j=1}^{N} \sum_{i=1}^{N-1} \delta(x_{i,j}, x_{i+1,j}) + \sum_{i=1}^{N} \sum_{j=1}^{N-1} \delta(x_{i,j}, x_{i,j+1})$

So: **first sum**: all changes along row i
second sum: all changes along column j.

The cube has 6 identical faces. Let them be generally denoted by $f=1,\ldots,6$, each with its own grid $x_{i,j}^{(f)}$. Then the **general formula** for the total information is:

$$I_{gesamt} = \sum_{f=1}^{6} I_{Fläche}$$

and substituting the formula for the area yields:

$$I_{gesamt} = \sum_{f=1}^{6} \left[\sum_{j=1}^{N} \sum_{i=1}^{N-1} \delta(x_{i,j}^{(f)}, x_{i+1,j}^{(f)}) + \sum_{i=1}^{N} \sum_{j=1}^{N-1} \delta(x_{i,j}^{(f)}, x_{i,j+1}^{(f)}) \right]_f \quad (1)$$

This is a clean, general definition of information for the **number of visible structural changes** on the surface, without probabilities.

- There are $2N$ lines on each face.
- There are at most $N-1$ possible transitions in each line.
- The **maximum** information per face would therefore be $I_{Fläche,\ max} = 2N(N-1)$ if every adjacent pair is different. The maximum visible information for the entire cuboid is then $I_{gesamt,\ max} = 6 \cdot 2N(N-1) = 12N(N-1)$.

For the example N=10 from Figure 1, we obtain: $\boldsymbol{I_{gesamt,\ max} = 12 \cdot 10 \cdot 9 = 1080\ bit}$ as information capacity in the chosen scaling.

Now we want to consider the dynamics across all cells, including their internal states, because a change of state occurs through the movement of the cell contents with their micro states through the field, which Ludwig Boltzmann identified as temperature. For this purpose, we consider a cube with N^3 cells. We extend our example from Figure 1 to 10×10×10 cells.

1.1 Limitations of variability due to attachments

In nature, phases differ in their rigidity at a given temperature, which we can simulate here by attaching cell contents. A frequently observed phenomenon of movement is **fluctuation**, which we imitate by exchanging the cell contents of neighboring cells. While the white and yellow elements can be swapped individually, the blue elements can only be moved in pairs, and the black elements only in groups of eight, forming a cube. However, to move elements, we need degrees of freedom. On the left side of Figure 1, the matrix is closed, and all spaces are occupied; on the right side, the matrix is open. Two spaces are free because two elements have been moved to the outer area. To perform a permutation of the arrangement, we need degrees of freedom. By defining packages that can only change their position together, we achieve true dynamics in the micro-states. Compared to the previous example, the following changes have been made. We now have four types of objects:

- **White, Yellow**: Single cells, freely permutable, represent plasma and gas.
- **Blue:** Pairs (dimers) that always remain together, i.e., two connected cells, represent liquid.
- **Black:** Eight-unit blocks in a cube (hexahedron), i.e., solid 2×2×2 blocks. Represents solids.

The important point is that not every cell arrangement is permissible anymore – only those that can be assembled from these packages by moving them around. The "elementary unit" is therefore no longer the cell, but the package. This is still "visible information" – only that not every pattern is now feasible. This restriction of variability affects the micro-state space.

- Previously, each of the N^3 cells could be freely white/yellow/blue/black. This, in consultation with the surrounding environment, revealed a huge number of possible patterns on the surfaces. Since we have 250 elements of each type, you can create 125 blue pairs that can move vertically or horizontally through the cuboid, and 31 cuboids of 8 elements each. The remaining space from the two black elements is added to the surrounding area to create degrees of freedom. All neighboring elements of these empty places can now swap positions.

- Now we have the following scenario:

    - n_W = 250 white single cells
    - n_Y = 250 yellow single cells
    - n_B = 125 blue pairs
    - n_S = 31 black four-packets

Only arrangements that result from non-overlapping placements of these packets are allowed. Formally, one can say: Instead of directly permuting the cells $x_{i,j,k}$, we permute packets$P_1,\ldots,P_M$,, with $M=n_W+n_Y+n_B+n_S$

Each packet micro-state generates a specific cell image $\{x_{i,j,k}\}$, and thus a specific surface image $\{x_{i,j(f)}\}$. In motion, we obtain a sequence of images of states whose information grows exponentially. To distinguish this from unrestricted static information, we use the symbol Ω. To linearize the process, we work with the logarithm of this information. We now refer to this as entropy. Through packetization, we obtain two clean working planes:

1. **Packet entropy** (micro level): Entropy as the logarithm of the number of possible packet configurations: $S_{pakete} \sim log_2 \Omega$, where Ω is the number of all different possible arrangements of 31 black cubes, 125 blue pairs, 250 white and 250 yellow single cells in the 10^3 grid (under the condition: no overlap, pairs only along the axes, etc.)**.**
2. **Surface entropy** (visible plane): The previous value I_{total} (configuration) as a function of the respective package configuration is retained according to formula (1), but the range of values for $x_{i,j}^{(f)}$ is restricted because not every "wild" surface is physically realizable anymore. The variability of permissible surface images is limited by the 31+125+250+250 building blocks.

The formula remains formally identical (1), but

- For I_{total}: The definition is already general; what changes is the set of configurations over which one might want to average (e.g., expected entropy or I_{total} with random arrangement of the building blocks).
- For $S_{\text{building blocks}}$: An exact closed-form formula for Ω (the hidden information) is combinatorially very complicated due to the geometry (cube, dimers, non-overlap, boundary). However, you can write it symbolically: $S_{building\ blocks} = log_2 \Omega$ *(31 cubes, 125 dimers, 250W, 250Y, N=10), and then work with approximations (e.g., "dense packing" vs. "sparse packing with grey cells between ").*

1.2 The two Cases

You can now develop approximation formulas for two cases

1) for an entropy as $\log_2$ (number of possible block arrangements), or
2) for the expected transition measure I_{total} on the 6 surfaces under these block rules

Case 1): Entropy as the number of possible arrangements of building blocks

If we consider the cube with a scale of 10^3 containing

- 31 black blocks of 2×2×2 cells
- 125 blue pairs (dimers of 2 cells, along the axes)
- 250 white single cells
- 250 yellow single cells
- 2 grey cells for swapping

all 1000 grid spaces are filled.

Case 1) 1. Idealized counting without geometry restrictions

If we briefly pretend that all "building blocks" are simply labeled packages with a fixed number of cells (without regard to shape and spatial arrangement), then the number of assignments of the 1000 cells to these packages would be roughly:

$$\Omega_{ideal} = \frac{1000!}{8!^{31} \cdot 2!^{125} \cdot 250! \cdot 250!} \qquad (2)$$

Here are:

- 1000!: all possible permutations of the cells (The permutation of identical cells does not contribute to the information!)
- Division by:
  - (8!)31: because the 8 cells within each black cube are indistinguishable from one another
  - (2!)125: for the 125 dimers
  - 250! and 250!: because the white and yellow individual cells are identical

The corresponding entropy in bits would be: $\boldsymbol{S_{ideal} = log_2 \Omega_{ideal}}$.

This is an "upper bound" because we are ignoring the geometric constraints (packing on the grid, no overlap, allowed orientations).

Case 1) 2. Realistic counting with geometric constraints

In reality, Ω is smaller because:

- the 31 black blocks can only be located at specific (discrete) positions,
- the blue pairs can only be located horizontally/vertically on grid edges,
- nothing can overlap.

Formally, this can be written as: $\boldsymbol{\Omega_{real} = F_{geo} \cdot \Omega_{ideal}}$, were $F_{geo}<1$ is a complicated geometric factor that contains all packing restrictions. The micro-entropy of the building blocks is then:

$$\boldsymbol{S_{bausteine} = log_2 \Omega_{real} = log_2 \Omega_{ideal} + log_2 F_{geo}}.$$

This results in a clear structure:

- Ω_{idea}: pure combinatorics of the types and package sizes
- F_{geo}: loss of possibilities due to shape, rigidity, and packing constraints

This formula is "general" in the sense that any change in the number or size of the building blocks directly affects Ω_{idea} and F_{geo}.

Case 2): Surface entropy across visible transitions

We again use the “surface-based” information definition according to formula (1): We count transitions between different colors along the rows and columns of the 6 surfaces.

$$I_{gesamt} = \sum_{f=1}^{6} I_{Fläche\, f}.$$

If the building blocks are distributed "randomly" within the volume (according to the rules above, because the rule set is incomplete), then I_{total} results as a random variable. You can then meaningfully

speak of the **expected value** $\langle I_{total} \rangle$. $\langle I_{total} \rangle$ is then the average number of visible transitions across all 6 surfaces. Roughly speaking, this expected value depends on two things:

1. **Color distribution:** What is the probability that two adjacent cells have different colors?
2. **Building block size:** Large, rigid blocks create longer, continuous color areas → fewer transitions.

If, for example, all building blocks are "dissolved" into individual cells with equal color proportions, the system more closely approximates a "random color mix," and the probability of color changes between neighbors increases → $\langle I_{total} \rangle$ becomes larger.

1.3 Movement and Decomposition:

"The change in entropy arises from the ratio of motion to the decomposition of the building blocks." Entropy change can now be formulated very precisely as the ratio of two states.

1. **Intact building blocks**: 31 black blocks, 125 dimers, 250 + 250 individual cells.
   Entropy $S_A = S_{\text{building blocks,intact}} = \log_2 \Omega_{\text{real,intact}}$.
2. **Partially/increasingly decomposed building blocks:** e.g., black cubes into smaller packages, dimers into individual cells. Many more degrees of freedom.
   Entropy $S_B = S_{\text{building blocks,decomposed}} = \log_2 \Omega_{\text{real,decomposed}}$.
3. The change in entropy is then: $dS = S_B - S_A = \log_2 \left(\frac{\Omega_{real,\,decomposed}}{\Omega_{real,\,intact}} \right)$.

This expresses precisely this relationship between movement and decoposition: The more you decompose the building blocks (more internal degrees of freedom), the larger the space of achievable configurations becomes – even if the "pure movement" of the original large building blocks was limited. Visible at the surface level:

- Intact large building blocks → relatively smooth surfaces → small $\langle I_{total} \rangle$
- Decomposed building blocks → finer granular patterns → larger $\langle I_{total} \rangle$

The idea of the relationship can therefore be formulated as follows:

- **Movement of the building blocks:** changes the arrangement within the existing, limited state space.
- **Decomposition of the building blocks:** enlarges the state space itself.
- **Entropy change** arises primarily from this enlargement:
  $dS = \log_2 \left(\frac{State\ space\ before\ disassembly}{State\ space\ after\ disassembly} \right)$

2. Example calculation for 2 specific scenarios:

We take a clearly defined decomposition scenario, calculate the entropy change ΔS and neatly connect this with the idea of "motion vs. decomposition".

2.1 Szenario1: Decomposition of the dimers

All blue dimers are broken down into single cells. The black 2×2×2 blocks remain intact.

That means:

before:	after disassembly:
• 31 black blocks • 125 blue pairs • 250 white single cells • 250 yellow single cells	• 31 black blocks • **0 blue pairs** • **250 blue single cells** • 250 white single cells • 250 yellow single cells
$\Omega_{before} = \frac{1000!}{8!^{31} \cdot 2!^{125} \cdot 250! \cdot 250!}$ $S_{before} = log_2 \Omega_{before}$	$\Omega_{after} = \frac{1000!}{8!^{31} \cdot 250! \cdot 250! \cdot 250!}$ $S_{after} = log_2 \Omega_{after}$.

This only changes the structure of the blue elements – and that is precisely what creates the change in entropy.

- **Entropy before decomposition:** The ideal combinatorics (without geometric restrictions) is: $\Omega_{before} = \frac{1000!}{8!^{31} \cdot 2!^{125} \cdot 250! \cdot 250!}$ Entropy is $S_{before} = log_2 \Omega_{before}$.
- **Entropy after decomposition:** Now there are no more dimers, but 250 blue individual cells. According to combinatorics, the number of arrangements is:
  $\Omega_{after} = \frac{1000!}{8!^{31} \cdot 250! \cdot 250! \cdot 250!}$ Entropy is $S_{after} = log_2 \Omega_{after}$.
- **Entropy change due to decomposition**: The entropy change is $dS = S_{after} - S_{beforer}$.

$$d S = \log_2\left(\frac{\Omega_{after}}{\Omega_{before}}\right) \text{ results in: } .d S = \log_2\left(\frac{2^{\square}!^{125}}{250!}\right) \qquad (2)$$

Entropy increases because:

- A dimer has 1 degree of freedom (position + orientation)
- Two individual cells have 2 degrees of freedom (each cell is independent).
- Decomposition therefore doubles the mobility of the blue elements.

Since 250! in (2) is gigantic, the denominator is much larger → ΔS is positive and large. The change in entropy arises from the ratio of the motion to the decomposition of the building blocks. Now we can express this mathematically:

- Movement: Number of possible permutations of the building blocks
- Decomposition: Increase in the number of independent building blocks

  Formally: $d S = \log_2\left(\frac{degrees\ of\ freedom\ after\ decomposition}{degrees\ of\ freedom\ before\ decomposition}\right)$

Implications for our scenario:

- Before: 125 movable units → After: 250 movable units
- Doubling of degrees of freedom → huge increase in combinatorics
- Significant jump in entropy

The change in entropy is: $dS=S_{vor}-S_{nach}$. $dS = \log_2\left(\frac{\Omega_{vor}}{\Omega_{nach}}\right) = \log_2\left(\frac{250!}{(2!)^{125}}\right)$

Since $(2!)^{125}$ is less than 250!, the fraction is greater than 1 → $dS > 0$. The entropy increases because:

- A dimer has 1 degree of freedom (position + orientation).
- Two individual cells have 2 degrees of freedom (each cell is independent).
- Decomposition therefore doubles the mobility of the blue elements.

2.2 Scenario 2: Negative Entropy Change Through Structuring

The process from Scenario 1 is reversible. Attachments are forced when freedom of movement decreases. We maximize entropy and attempt to form pairs of blue and black elements, calculating the negative entropy change. From "more freedom" comes "more structure" again – and we calculate the entropy in reverse.

From a maximally unmixed state, dimers and blocks are formed.

before: 1000 single cells	**after: pairs and blocks**
• 250 white single cells • 250 yellow single cells • 250 blue single cells • 250 black single cells $\Omega_{max} = \frac{1000!}{250! \cdot 250! \cdot 250! \cdot 250!}$	• 250 white single cells • 250 yellow single cells • **125 blue pairs of 2 cells** • **31 black blocks of 8 cells each** $\Omega_{strukt} = \frac{1000!}{(8!)^{31} \cdot (2!)^{125} \cdot 250! \cdot 250!}$
Entropy: $S_{max}=log_2\Omega_{max}$. This corresponds to the "maximum entropy".	Entropy: $S_{struct}=log_2\Omega_{struct}$. Reduction through structuring

We calculate the entropy change as $\Delta S=S_{struct}-S_{max}$. by forming the ratio $\Omega_{struct}/\Omega_{max}$
The 1000! cancels out, leaving:

$$\frac{\Omega_{struct}}{\Omega_{max}} = \frac{(250!)^4}{(8!)^{31} \cdot (2!)^{125} \cdot 250! \cdot 250!} = \frac{(250!)^2}{(8!)^{31} \cdot (2!)^{125}}.$$

$$\text{Also: } dS = \log_2\left(\frac{(250!)^2}{(8!)^{31} \cdot (2!)^{125}}\right)$$

Because $(8!)^{31}(2!)^{125}$ is enormous, the fraction is much smaller than 1 → $dS<0$. **The entropy becomes negative!**

2.3 Physical interpretation

In a state of maximum entropy, 1000 independent elements move within a 1000-matrix in exchange with their environment. This means that **the system is open** and its environment must be considered with a sufficiently large number of degrees of freedom, given an **external entropy change dS_{ext}.** Forming pairs and blocks couples degrees of freedom.

- 2 blue cells → 1 movable unit (dimer)
- 8 black cells → 1 movable unit (cube)

The state space shrinks by a factor of $\frac{\Omega^{\square}_{struct}}{\Omega_{max}} = \frac{(250!)^2}{(8!)^{31} \cdot (2!)^{125}}$.

This is precisely what results in a negative change in inner entropy:

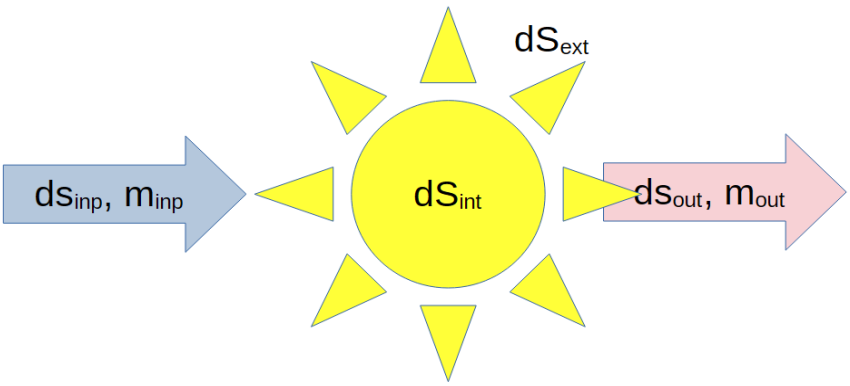
$$d S_{\text{int}} = \log_2\left(\frac{State\ space\ after\ structuring}{State\ space\ before}\right) < 0$$

Or in other words: Structuring (pair and block formation) is the exchange of the freedom of movement of individual elements for solid building blocks – and the entropy change measures this exchange ratio directly as the logarithm of the state-space ratio. We also achieve greater freedom of movement when, as shown in Figure 1, more cells are emptied and the elements are released into the environment, thereby reducing the pressure and increasing the freedom of movement.

3. What do we learn from the example above?

3.1. Solar Nuclear fusion

In the theory of the electric universe, all phenomena at the micro level can be traced back to two oppositely charged, stable current vortices: the electron and the proton, whose spin is responsible for the dynamics of matter. All known substances in the real world can be assembled from these two elementary particles. Without the whole other "particle zoo" of unstable fragments, the theory becomes much simpler and easier to understand. To achieve nuclear fusion, the entropy in the reaction regime must decrease, as we learned in Section 2, because nuclear fusion involves the formation of atoms from protons and electrons, which should work similarly to our Scenario 2.



$dS_{Sun} = dS_{inp} - dS_{out} + dS_{int} = dS_{ext} + dS_{int}$
Nuclear fusion: If $dS_{ext} < 0$ and $dS_{int} < |dS_{ext}|$, then $dS_{Sun} < 0$

Figure 2:Condition for nuclear fusion

This seems to contradict the second law of thermodynamics. However, Ilya Prigogine had a brilliant idea with his nonlinear thermodynamics, abandoning the concept of a closed system He described the process of decreasing entropy and the associated

increasing order in material structures as dissipative in an open system.[1] The entropy of the system then results from Figure 2 as:

$$dS_{sun} = dS_{inp} + dS_{int} - dS_{out} = dS_{ext} + dS_{int} \quad (4)$$

We can expect nuclear fusion when $dS_{ext} < 0$ and $dS_{int} < |dS_{ext}|$, because then $dS_{sun} < 0$. Let us consider the Sun in our galaxy. Optical spectra are helpful for this.

Let us now consider the solar spectrum. It is of the Planck type, meaning it is a black-body radiation emitted from a solid. This seems to have escaped the notice of atomic physicists, however, because for the last hundred years, textbooks have still claimed that the sun is a glowing ball of gas consisting of 92.0% hydrogen and 7.8% helium. The spectral data tell a different story, as Figure 3 reveals.

The plasma of protons and electrons doesn't need to be heated further, but rather cooled rapidly. It must condense. However, it's a misconception to think of the Sun as a closed system in whose interior fusion only occurs. We cannot see inside the sun. Its surface appears as a glowing melt, which, according to its spectrum, is a G2-class star rich in calcium. This fact also corresponds to its material density of 1.4 g/cm³.

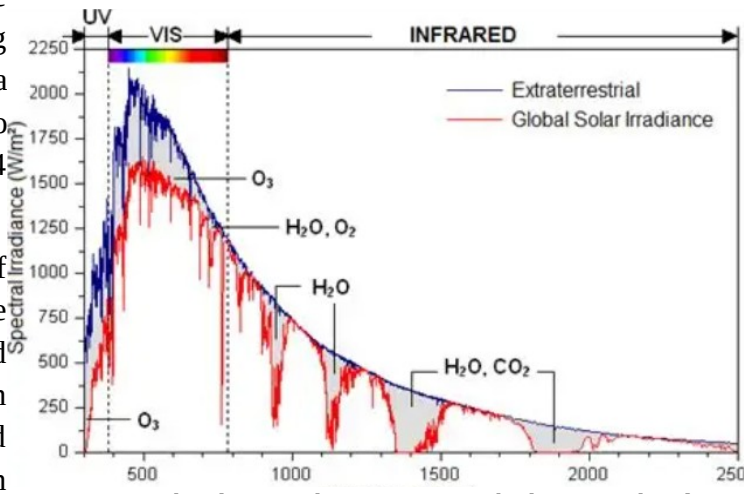


Figure 3: Planck-type solar spectrum, with absorption bands

If the solar system were a closed ball of gas, a continuous spectrum could not be expected, and the hydrogen lines would appear as emission lines, not absorption lines. At 656.2 nm, a sharp and strong red line of hydrogen emission, the hydrogen Hα-line, should be visible. However, this line is only relatively faintly visible in absorption. The helium line is only faintly visible in the corona during a solar eclipse.

Only when star formation is advanced does a continuous background spectrum develop, because all stars emit a Planck-type spectrum, similar to that of our Sun. Since the temperature maxima are found at different wavelengths, the spectrum of a galaxy will show a very broad background spectrum where the emission peaks of the gases stand out, as shown in Figure 4. The red H_α line of hydrogen is found in every galaxy. The blue H_β line at 486.0 nm disappears into the background radiation of stars in older galaxies.

Luminous cosmic gas clouds with a small number of stars are very rare objects. In my review of the SDSS database, I encountered such a spectrum only once. Mature spiral galaxies and old galaxies that have exhausted their gas supply are more common. Figure 4 shows the spectrum of a very young galaxy with a redshift of z=0.1552, which has almost no continuous background spectrum, meaning that star formation is just beginning. Only hydrogen and oxygen glow in the galactic plasma. The galaxy shows no internal structure yet. In contrast, the overlaid dark red curve shows the strong

[1] G. Nicolis - *Thermodynamic Theory of Stability, Structure and Fluctuation* ; Faculté des Sciences, Université Libre de Bruxelles, Belgium https://old.iupac.org/publications/pac/1970/pdf/2203x0379.pdf (22.01.2026)

background radiation of a spiral galaxy, caused by the many stars that have formed and are superimposing their Planck spectra. In addition to the H_α line on the right side of the spectrum, lines of nitrogen, sulfur, sodium, magnesium, and helium ions can now also be found. However, most of these ions are visible as absorption lines.

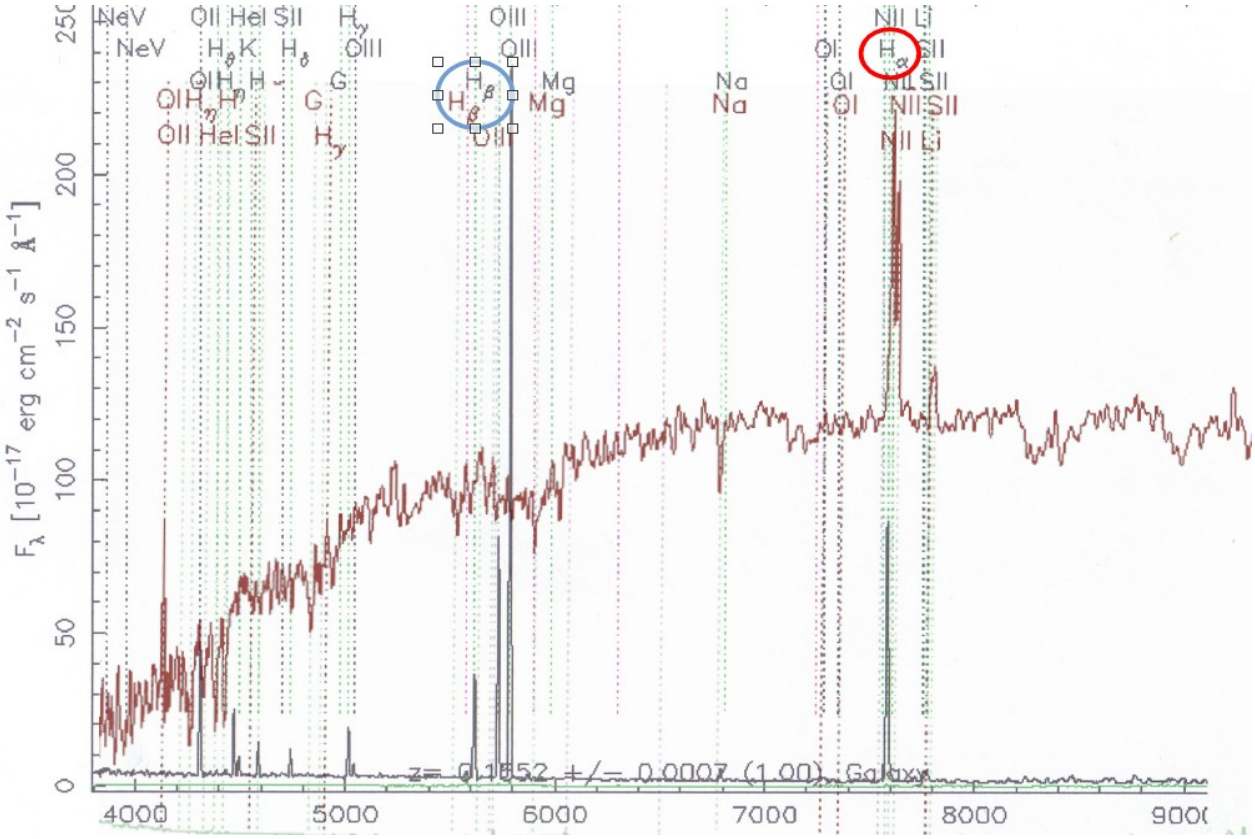


Figure 4: Spectrum of a very young galaxy (black) RA: 116.99 DEC: 23.61 and an evolved galaxy (red) RA: 126.49 DEC: 11.84 superimposed - Source: SDSS Database Release 7 https://classic.sdss.org/dr7/

As we established above, when structures are built up, the entropy change must become negative. The question, however, is: Where do we find regions of negative entropy change on the Sun? Since in the macro state dS=Q/dT, we must look for a negative temperature gradient in Suns environment.

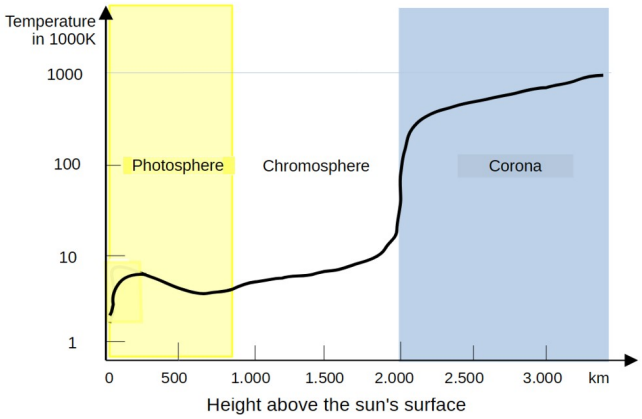


Figure 5: Temperature profile in the solar atmosphere according to Don Scott

We can only speculate about the interior of the Sun. We don't know if temperatures of several million degrees actually exist there. Boltzmann discovered an important relationship between speed and temperature. Temperature increases with the square of the speed of the atoms. Conversely, a decrease in temperature is accompanied by a restriction of the mobility of the particles. At very high pressure, an atom can hardly develop any speed. The situation is different in the sun's atmosphere. The Sun has a positive potential, which

accelerates the atoms like in a fluorescent tube. In the process, they are ionized, which accelerates the electrons in direction of the sun and decelerates the protons. This loss of speed of the protons is measurable by a temperature gradient. If we look at the temperature profile in the sun's atmosphere, we register a strong negative temperature gradient with a simultaneous electron deficiency at the boundary between the corona and the chromosphere.

This is not much different from the condensation of water vapor on a cold glass pane, except that the initial temperature must be high enough for protons and electrons to have the opportunity to combine to form elementary magnets, as I have already explained in my book[2]. The evidence that this actually happens at the boundary between the corona and the chromosphere is provided by the long-known Fraunhofer lines, which we find in the spectrum of the chromosphere. The notion that all hydrogen must first be converted to helium before fusion to form heavier atoms must be relegated to the realm of legend. This assumption results from the reversal of the decay of radioactive isotopes. What could possibly prevent neighboring elementary magnets from also combining to form larger atoms? With iron, a limit to the complexity of the atom is probably reached. Fusion to form heavier elements then also seems to be possible under pressure. This is because more electrons must be absorbed by the atomic nucleus than in the case of lighter elements, which leads to increased natural radioactivity in these elements.

3.2 Technical realization of nuclear fusion

Looking at the technical attempts at nuclear fusion, the first thing that comes to mind is the tokamak principle, which has been used in large-scale experiments with various modifications, such as the Stellarator[3], since the middle of the last century. While plasma with temperatures far exceeding those on the Sun is generated there, a negative temperature gradient was never the goal, and therefore no successes in nuclear fusion have ever been achieved. Figure 6 shows the work principle. Do you see a negative temperature gradient?

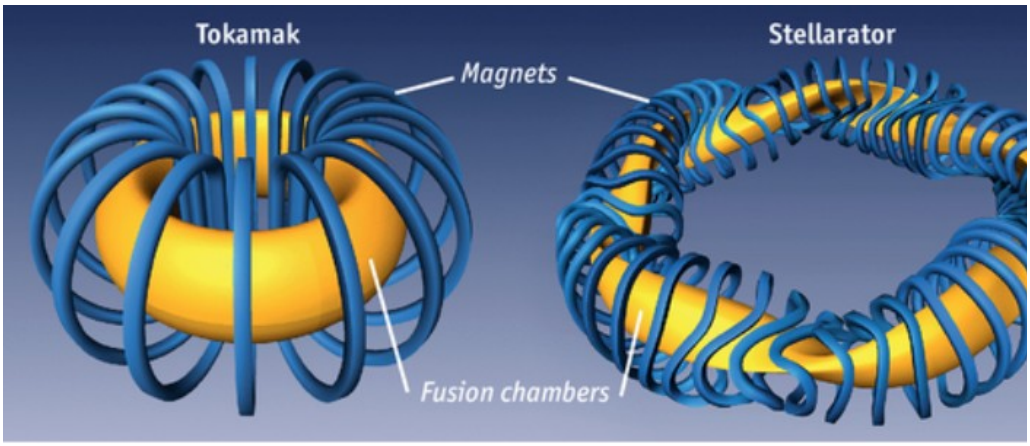


Figure 6: Large-scale experimental setup for nuclear fusion

[2] M. Hüfner - *Dynamic Structures in an Open Cosmos; Verlag: Books on Demand 2021 ISBN-13: 9783755713753*
[3] F. Fleschner - *Wendelstein 7-X*; https://www.ipp.mpg.de/wendelstein7x

In contrast, the experiment by Montgomery Childs and colleagues, known as the SAFIRE project[4], to operate an artificial sun in a hydrogen atmosphere, deserves special mention. There, the temperature gradient was created out of concern for damaging the anode. Additional internal cooling of the anode is certainly advantageous when high power output is achieved on the anode surface, as this waste heat can be utilized.

Figure 7 illustrates a very simple principle of a fusion experiment. However, this places high demands on the anode material and the heat transfer from the anode to the outside. Whether there are technical solutions for this is questionable, since continuous operation would involve a temperature gradient of several hundred thousand Kelvin.

In fact, at these temperatures, traces of elements were found on the anode that were not present in the experimental chamber before the experiment, namely a considerable number of different chemical elements from Mendeleev's table.

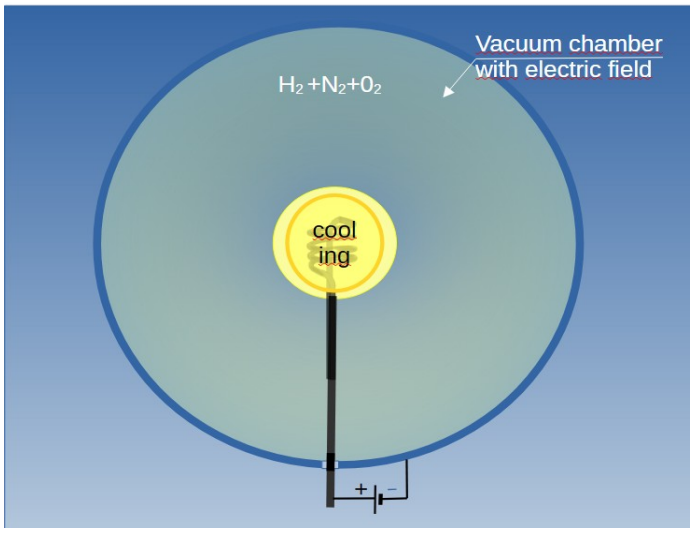


Figure 7: SAFIRE Typ of a Fusionexperiment with temperature gradient

[4] M. Childs a. o. - *Safire Project | The Electric Universe Theory;* https://www.electricuniverse.info/safire-project/ (22.01.2026)