These elementary applications of classic thermodynamics, based on the concept of entropy and on Bolzmann's Distribution, suggest to us that the phenomenon "life" is to be associated with a "vis-vitalis" external to the dissipative mechanism for which we have ample and daily experience.

Obviously it is impossible for man to build a Maxwell device but in our research we have found a very interesting observation by Jaques Monod (Nobel Prize in 1965) that confers the part of demon to the natural enzymes[7].

According to this point of view we can convert the *Figure 1.6* as follows:

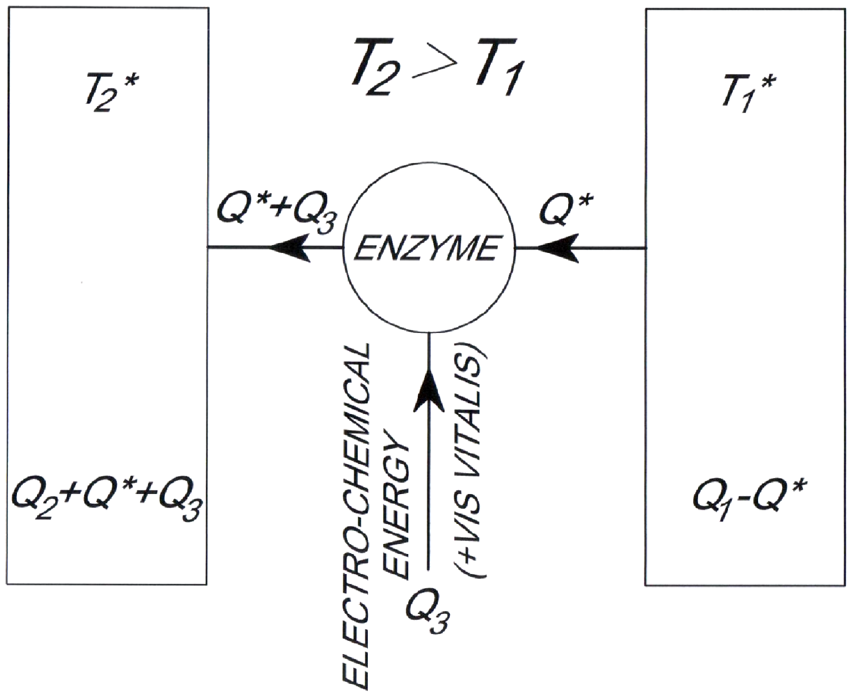

Figure 2.4 – The natural heat pumping performed by enzymes

and this sketch we consider as typical of the phenomenon "life".

The role played by the vis-vitalis seems essential, because the only electro-chemical energy associated with enzymes are components easily deliverable in the biological laboratories, but nobody has been able to start life from these components[8].

There are those who attempt an approach to this argument with improper methods and with arbitrary applications of the concept of probability, which leads to theories that are devoid of the required respect for a *sound scientific doctrine*.

2.2 CONCLUSIONS FROM THE FIRST AND SECOND PART

Rivers of ink have been written about the origin of life, to the point that it is possible to read about the most bizarre theories that completely ignore that which is suggested by the Queen of Physics: Thermodynamics.

Paleontology, Biology, extraterrestrials, UFOs, Cosmic Palingenesis and similar are all stirred: numbers, equations, concepts of probability, principles of conservation, etc, are not used

[7] *Le hazard et la nécessité, 1970 – Arnoldo Mondadori Editore Spa. – Milan – Pag. 58*
[8] *See the Stanley Miller experiment at the end of paragraph 5.4*

correctly. These are the only foundations possible for a correctly stated *scientific* discussion (there is no adjective more abused than the term “scientific”).

The reader could (perhaps on a rainy Sunday) do some research on the “primordial” soup (but if it is not Knorr, for who’s brand, modestly in youth, we made thermodynamics projects, does not taste good!...), on the “cosmic tank”, on the “typing monkeys”, on the cycle of carbon and oxygen (in relation to the demonization of CO_2), on the hydrological cycle (which is a substance that cannot be “consumed”, as is currently heard said, otherwise what cycle would it complete: subjects often treated by substituting Science with ideology and making ample use of the principle of superior authority (the *ipse dixit* of historical memory), upholding disjointed dogma, *but which are politically correct*.

Sometimes one has the feeling of witnessing the squalid discourse of gossiping women by the fountain!...

It can be noted that in the observations made up to now, we have practically not talked about energy, who’s role in the economy of our discourse has been secondary. It’s the definition of the entropy *index state* which changes the way to view the cosmos: we would not talk of it if it were possible to carry out reversible reactions.

We would come to suspect that the irreversibility is a *“defect”* of the cosmos, having the function of forcing it to a gradual entropic enrichment (and therefore to a degeneration of energy) such that the final form of all the energy available becomes one that is thermally and entropically unusable: therefore, by virtue of what has been discussed, at a certain point in the evolution of the universe, *at a finite time*, it will not be possible to practically perform any thermodynamic cycle[9].

That is to say the thermal death of the universe.

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[9] *We will be further willing to suspect a decay of the cosmological properties correlated to the original sin,. Ah! free thought!...*

Part 3 (of 4): Probability

3.1 PROBABILITY IN BOLTZMANN'S STATISTICS

Boltzmann obtained the graph of the probability as a function of temperature, postulating that a certain number *m* of particles, which are indistinguishable from each other (which we will call *A, B, C, ..., M*), and a number *n* of possible states (*a, b, c, ..., n*) in which one or more particles (even if *m*) can find themselves; the presence of particles in each state could occur with different possibilities.

If the identical particles are free to occupy the various states (as in the case of a gas), these could continuously exchange states between themselves (for example thanks to reciprocal impacts, as in *Figure 2.3*), whilst "on average" maintaining a certain distribution: subject to the conditions around them (for example temperature), a certain distribution of the possible configurations would be typical of such conditions.

Continuing with this example, if by state of the particles we mean possessing a certain amount of kinetic energy *E* associated with each molecule of a gas, in a certain interval of values of energy ΔE, there will be a stable quantity of molecules, even if amongst themselves continues exchanges of energy occur. Therefore, in the range of the same interval, some particles enter and some leave.

If, for the sake of imagination, in what follows, particles will be considered as "balls" and states as levels of energy, the balls will represent the particles, while the levels will represent an interval of energy (ΔE).

Let us start with a very simple case consisting of 3 particles (m=3) able to be hosted by two levels (n=2), as illustrated in *Figure 3.1*.

In the left column we see all the possible combinations. In the central section we see that certain combinations repeat themselves in such a way that, if the particles become indistinguishable (column 3), they are to be considered the same amongst themselves.

Therefore, three possibilities exist such that both the combinations *2,3,4* and *5,6*,7 can occur and only once for the combinations *1* and *8*.

If we "normalize" the possibility (expressing it in unitary or percentage terms), it assumes the role of probability (*ratio between favorable cases and possible cases*), which we have done in the last column by expressing it in percentage terms, as is common practice.

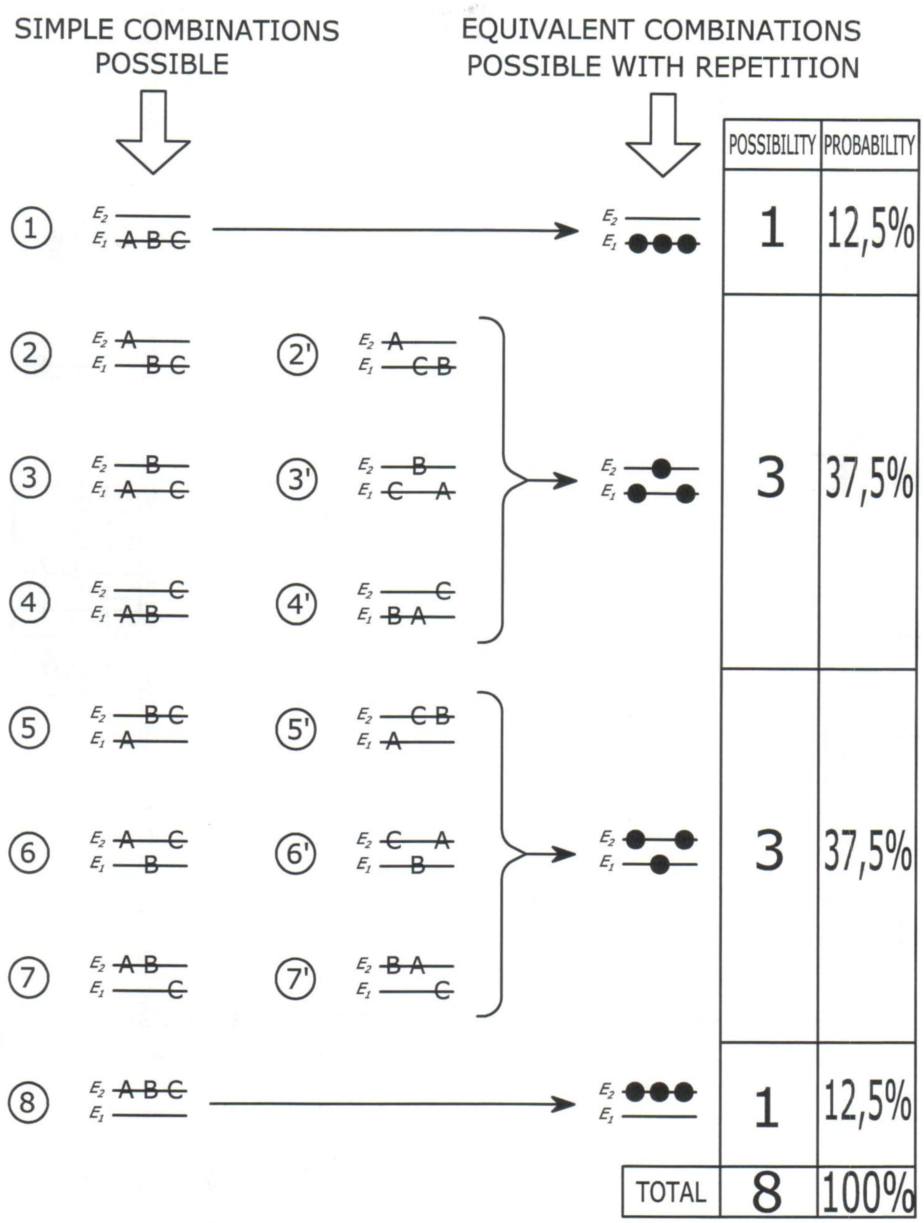

Figure 3.1 – A rather simple case to demonstrate how, given m=3 and n=2, it is possible to have different probabilities for each combination.

This allows us to draw the graph of *Figure 3.2* where we can begin to see the Boltzmann distribution forming:

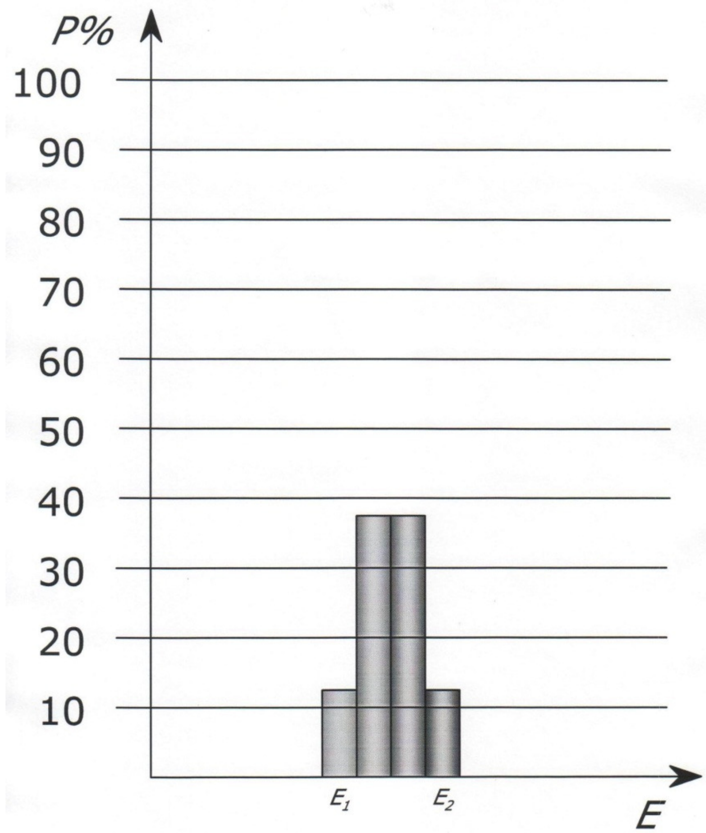

Figure 3.2 – The embryonic Boltzmann diagram: increasing particles and the number of possible states, the envelope of the columns (in this particular case not yet) acquires the characteristic <u>*asymmetric*</u> *bell shape.*

Following in the footsteps of the great Ludwig we enter into systems which are numerically more substantial: *three* combinations of *seven* states with an arbitrary arrangement of *four* particles as represented in *Figure 3.3*; the three combinations are equivalent because the particles are indistinguishable, by hypothesis.