

1. "The gravitational field *is* space". This idea summarises Einstein's General Theory of Relativity and enables *force* to be thought of as a *curvature*, thereby reducing Mechanics to Geometry. The *Principle of Equivalence* postulated in the present paper enables *scales* and *rulers* to be calibrated, just like *clocks*, whose calibration was achieved thanks to the Theory of Special Relativity through the constancy of the speed of light for all inertial systems. Using the same method, in this paper we deliberate on the meaning of *temperature*, and put forward a new theory that covers not only rulers, clocks and scales, but also *thermometers*. To this end, we propose to use the concept of *curvature* (of space-time) to provide a solution to the problem we seek to solve.

2. In order to illustrate what we propose to do in this paper, let us use the ideal gases equation. If, in equilibrium,  $PV = NkT$ , it can easily be demonstrated that by rewriting this as  $F/S = NkT/V$ , we obtain  $T/F = V/S \cdot (1/Nk)$ , where  $F$  is force and  $S$  is surface. The *analogy* between *force* and *temperature* can be seen here in graphical form. It illustrates the problem we propose to solve: just like *force* (the force of gravity, that is, weight), *temperature* (of the contents of the container) is also a kind of *curvature* (of the space-time present here). For greater clarity, let us write this as  $T = f(R) \cdot (1/Nk)$ , where  $R$  is Einstein-Riemann's curvature.

3. But, this being so, we are forced to recognise that the traditional interpretation of what is meant by temperature cannot be correct. It is rather merely an *approximation* of what temperature really is. In the *probabilistic* aspects of Statistical Mechanics a more intimate relationship between thermal phenomena and gravitational phenomena is hidden. That is, *geometry* and *heat*, the *gravitational field* and the *thermal field*, are names for the same thing. Just as we must not fail to take into account the *plastic aspects* of heat, so we must not disregard the *thermal aspects* of space. *Rulers* and *thermometers* being two instruments for measuring the same thing, we should seek to clarify what this really means.

4. The *discreet, scalar, temporal, irreversible* nature of thermal phenomena must have a *plastic version*, just as the *oriented, vectorial, spatial, reversible* nature of gravitational (mechanical) phenomena – that is, the nature of what is meant by the curvature of space-time – must have a *thermal version*. This *new principle of equivalence* should produce an *Equation*, of which Statistical Mechanics and the General Theory of Relativity may be understood as *approximations*. All phenomena which bring together these two theories should be able to be more easily explained as expressions of what we are seeking in this paper.

5. Take the case, for example, of the seemingly contradictory way *entropic processes* are presented in the *two phenomenologies* (thermal and gravitational) above. The frontier regarded as *equilibrium* in thermodynamics should be characterised *geometrically* in the new framework. This is also the case with *black holes*, whose temperature may be obtained, with the help of statistical methods, as might be expected, by the complexification of the coordinates used in the solution of Einstein's equation. It is also the case that *Quantum Mechanics* itself may now be understood as a kind of unfinished *bridge* linking the thermal and the gravitational, leading to paradoxes that should be able to be eliminated by means of a new *doctrine of time*.

6. I would like to stress that in this formulation of Physics the question of time undergoes a radical transformation, the term no longer being used. *Time* is henceforth merely the *name* given to the processes that must be explained with the help of rulers and thermometers; and the theory – outlined here – that seeks to explain the relationship between them. Having thus far presented itself in a dual-faceted form, time may be understood in either *thermal* or *plastic* terms. In order that this should not be so, the *irreversibility* of thermal phenomena must be able to be read as *polarity* of gravitational (mechanical) phenomena – and vice versa. Inherited equations must be corrected in order for them to be compatible for all *scales* of Nature.

7. Considering that, from a dimensional point of view,  $T d^3 = K = G/k (h/c)^2$ , we have  $T = K/d^3$ , where a  $K$  is a new *fundamental constant*. Taking into account the ideal gas equation, we obtain  $N (Kk) = PV^2$ . But if  $G = c^2 \cdot d/m$ , we have  $K = d/m \cdot h^2/k$  and  $PV^2 = d/m \cdot Nh^2$ . Considering that  $d/m = G/c^2 = Q = \lim \phi(R)$ , where  $\phi(R)$  is a function of the *curvature of space-time*, we have  $PV^2 = NQh^2$ . If we consider that  $PV^2$  may be understood as an additional function of the curvature  $\phi^*(R)$ , we have  $\phi^*(R) = NQh^2$ . In the knowledge that  $N$  is, for equilibrium, a constant of the theory of gases, the following question arises: what *meaning* should be assigned to  $N$  in the new context?

8. I propose that  $N$  should henceforth be understood as part of a *succession* of natural numbers which enables the description of the entire *spectrum* of states of matter, of which it is merely a *particular case*. But this means that the *quantification* of space-time should be able to be applied not only to thermal phenomena but also to gravitational phenomena at all scales of Nature. We then have  $\phi^*(R) = N^*Qh^2$ , where  $N^*$  acquires different values for each state of matter, ranging from *photonic gas* to the *black hole*, including the Cosmos, the galaxy, the star and its planetary system, and the atom and its particles.

9. Here,  $N^* = N$  is merely the value known as (thermodynamic) *equilibrium*, for which there is a *change of sign* for the curvature of space-time. For this value, the fundamental equations of Statistical Mechanics and General Relativity – understood here as *approximations* of the General Theory – are now equivalent: both can be used to describe an object characterised equally by its thermal aspects or its gravitational aspects. I would like to point out that for  $N^* = 1$ , we obtain, thus, the following *definition* of  $h$ :  $h^2 = \phi^*(R)/Q$ . To conclude, I would add that the theory proposed in this paper enables the problem of so-called 'dark' mass and energy to be seen in a new light: perhaps they are just the "ether" without which, in the absence of a better idea, physics today cannot do. This is what I seek to do by *postulating* a new *limit*, the *fundamental constant* of which all other constants may come to be understood as functions.