



## **Science and the Soul/Body Problem: An Exploratory Reassessment**

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### **Introduction**

Recent progress in basic physics and cosmology involving the concept of a Universal Wave and Force field (UF) related to the Chaplygin/Tangent gas in Quadrant I on the p-v energy diagram, and requiring only the application of the standard physics of compressible fluid flow, has resulted in solutions to long standing basic problems in gravitation, quantum physics, electromagnetic radiation transfer and cosmology. This progress has prompted further exploration of the unusual properties of the UF in Quadrant II, which now point toward a need for a reassessment of the input of science to the classical Soul/Body problem of philosophy.

### **The Soul/ Body Problem in History**

The concept that a *soul* or spirit is an essential distinguishing element of a human being has apparently been the almost unanimous belief of western philosophers from ancient and classical times with perhaps two exceptions [1]: Lucretius among the ancients thought that the human soul was simply an extended thinking organ of the physical or material body; Berkeley in the 18<sup>th</sup> century held the nearly reverse position that the only reality is soul or spirit and that matter is an illusion.

The view of Aquinas [2] which generally prevailed till well after the Enlightenment, was that that the soul, the seat of distinguishing human rationality, was actually the central 'form' of the entire body, designed to be intimately united with matter, but capable of a separate, though incomplete, existence apart from the body after death, until a final reunion with a different kind of physical body at the end of time.

With the continued rise of physical science, and especially after the successes of the mechanics of Galileo and the astronomy of Newton, the feeling that the scientific method was the only true source of solid human knowledge gradually emerged, and a view began to spread that the methods of philosophy and natural theology, being less certain, should give way to science in any matter of doubt or conflict. Since the concepts of spirit and soul were by definition immaterial and outside experimental, quantitative science, they went first into dispute, then to decline and finally to widespread disregard.

Eventually, with the emergence of electromagnetism, deep conceptual problems arose for science in the attempts to understand how electromagnetic radiation could travel through the vacuum of space, and this in turn led to the very useful, but conceptually troubling, postulates and methods of special relativity [3, 14, 15]. Then the rise of quantum physics – extraordinarily precise yet conceptually still adrift – led to the general exclusion of philosophy from the popular sphere.

However, progress in basic physics and cosmology has now led to a possible way forward. The recent detection of an acceleration in the rate of expansion of the universe [4,5,6] caused a crisis in the Standard Model of cosmology which is based on general relativity, and pointed to the existence of a cosmic exotic fluid medium, the Chaplygin gas, having ‘negative pressure’, as a possible solution. This will be discussed below, but first we outline the traditional philosophic attributes of soul or spirit.

### **3. Traditional Philosophical Attributes of the Soul in Relation to Matter**

Without in any way attempting to be exhaustive, the main traditional, or orthodox attributes of the human soul in western philosophy would seem to include the following [2,7]:

1. The human soul is intelligent, meaning that it exhibits a sensitive attentiveness towards order, design, meaning, and probability in sensory data, accompanied by, and/or followed by, a rational, logical, judgmental grasp of that order, design, meaning etc.. In short, by ‘intelligence’ we mean the capability of human ‘understanding’ [7].

2. The soul is non-material and is not intrinsically quantified. It is not of the same substance as ordinary matter, and, while it may be associated with a particular quantity, it can also exist with various other quantities, and after death with none.

3. It constitutes the substantial dynamic 'form' of the body that it 'informs'. That is to say, it is adapted to 'informing' physical matter so as to constitute a living human animal.

4. The soul is incorporeal and subsistent; that is to say it is non-material and can exist apart from the material body it informs..

From the above elements we might devise traditional definitions of the soul as follows:

Human Soul: The sensitive, rational, subsistent, non-material, substantial, dynamic form that is specifically adapted to informing matter in a living human animal body.

Animal Soul: ( Plant soul) : The sensitive, intelligent but non -rational, mortal, material, subsistent, substantial form of the living, non-human animal ( plant) body.

We now turn to the properties of the UF and then compare them to those attributed by traditional western philosophy to the concept of Soul.

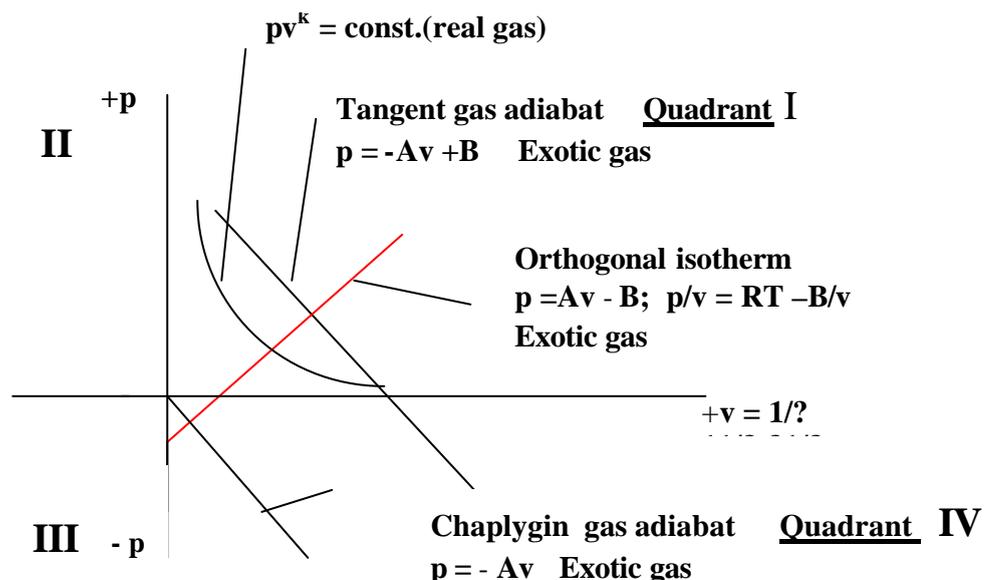
#### **4. The Concept of the UF and the Chaplygin/Tangent gas**

A theoretical gas ( the Chaplygin/Tangent adiabatic gas of Quadrant I on the p-v energy diagram, Figure 1) is currently being studied as an exotic cosmic fluid in cosmology to help explain dark energy, dark matter and an apparent speed-up in the expansion of the universe. Its property of having negative pressure in Quadrant IV is the attractive physical property in this regard [4,5,6]. Its physical properties are those described in gas dynamics and compressible fluid flow theory [8 - 13].

We have argued that this exotic cosmic fluid has isothermal as well as adiabatic motions, and so in Quadrant I it constitutes a universal compressible field (UF) with unique properties [14-15].

These properties include (1) the unique ability among known liquids or gases to propagate stable waves of any strength in both the compressive and rarefaction modes, which waves (2) uniquely obey the simple classical wave equation which underlies all of electromagnetism and quantum physics; (3) a unique ability to support transverse waves, which is something impossible for any other known or theoretical fluid, and which thus provides for the first time a physical basis for the physical existence of the electromagnetic field which transfers of Maxwell's radiation through space at the speed of light; (4) the unique ability to generate and carry gravitational waves which transfer gravitational force through space; (5) the unique ability to explain the physical basis of the wave/particle duality of matter in quantum physics on a purely rational and physical basis without any quantum weirdness, and finally (6) it supplies a new unifying cosmology, using only the know physical laws of compressible fluid flow, which provides a physical basis for the Big Bang, the origin of matter, the origin of cosmic inflation, and the physical evolution of the universe [8-16].

All of these successes have flowed from the application of the properties of the UF in Quadrant I of the p-v energy equation (Figure 1), where the Tangent gas has the equation of state  $pv^{-1} = \text{constant}$ , or  $p = -Av + B$ .

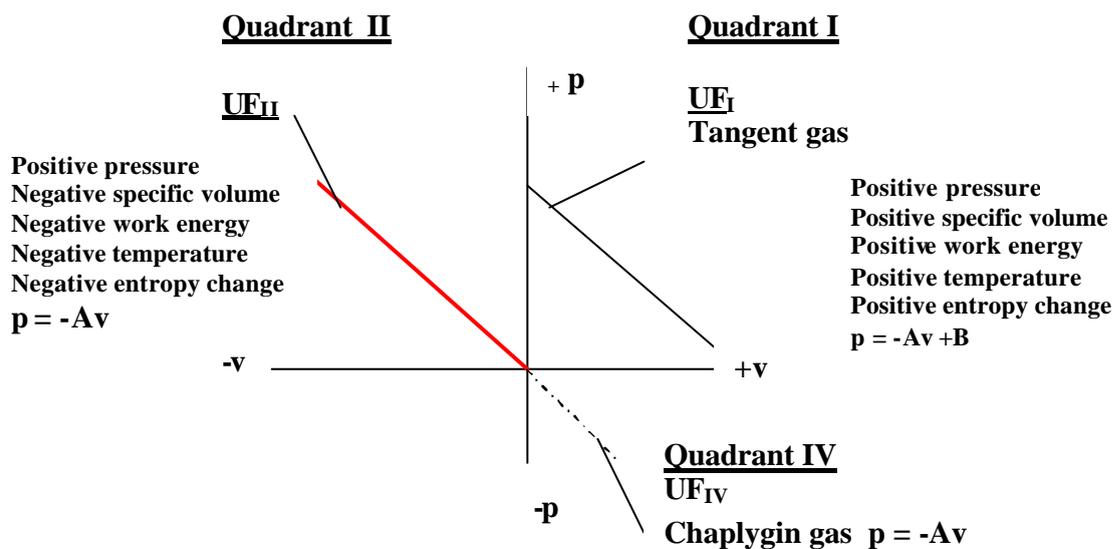


**Figure 1. Equations of State (pressure-volume relationships) for the Universal Field ( $k = -1$ ;  $pv^{-1} = \text{const.}$ )**

This series of successes has now prompted a further exploration of the properties of the UF into Quadrant II. This has led to a series of new insights which appear to relate to the classical philosophical attributes of the soul. This would appear to raise the Soul/Body problem anew with new input to philosophy from the scientific side.

**5. Properties of the UF in Quadrant II (UF)<sub>II</sub>**

The UF in Quadrant II is depicted in Figure 2.



**Figure 2. The UF properties in Quadrants I and II**

We see that the UF in Quadrant II (UF<sub>II</sub>) has the following properties:

- (1) It is dynamic, since it possesses work energy ( $pv$ ) as shown by its equation of state

$$pv^{-1} = \text{constant} (= RT \text{ at any point on the curve})$$

$$p = -Av$$

$$pv = -Av^2$$

(2) Its work energy (pv) is 'negative ' since in Quadrant II, while p is positive, v is negative and so

$$(+p)(-v)^{-1} = -RT \text{ (at any particular point on the curve)}$$

The 'negative' energy is taken here to mean "of a different nature" than positive energy.

3) The temperature T is also negative.

(This negative temperature may be related to the negative temperatures which are both predicted and experimentally verified in quantum physics).

(4) The  $UF_{II}$  supports stable dynamic (wave) 'forms'. This property is a consequence of the fact that the UF obeys the classical wave equation without any approximation (such as those needed for wave motions or wave forms in real material liquids or gases which exist only in Quadrant I).

Its wave speed is positive since since  $dp/dv$  is negative and therefore  $c^2 = dp/d\rho$  is positive in spite of the fact that  $\rho$  itself in Quadrant II is negative.

(5) The  $UF_{II}$  wave forms are non-material. That is to say, they are not of the same nature as the shock induced, highly compressed energy forms that constitute the elementary particles, atoms, molecules of ordinary matter, and which conform to the shock-related formula of material gases in Quadrant I [14-16]:

$$m_b/m_q = [n+1]^{1/2}$$

where  $m_b$  is the mass of any baryon,  $m_q$  is a quark mass and n is the energy partition parameter related to the adiabatic exponent k as  $n = 2/(k-1)$ .

(6) The UF forms in Quadrant II have negative temperature ( Item 3 above). Therefore, the entropy change dS is also negative

$$dS = dQ/T = dQ/(-T) = -[dQ/T].$$

While in Quadrant I, with its positive entropy change, the 2<sup>nd</sup> law of thermodynamics pushes inexorably towards disorder and random variability, in the UF<sub>II</sub> on the other hand the stable forms are oriented towards order, design and pattern. This intrinsic orientation points towards the UF<sub>II</sub> being a seat of a sensitive, dynamic, capacity and drive towards information i.e. towards intelligence and rationality.

(6) The UF in Quadrant II is intrinsically non-quantified. That is to say it can assume any energy value from zero to infinity without change in basic properties. [In Quadrant I, the energetic forms of ordinary matter are intrinsically quantified, since the p-v energy in real gases, for example, has a constant singular value, since  $pv = \text{const.}$  by definition. Even the UF's Tangent gas has limits set by the constant B].

(7) The UF<sub>II</sub> forms might be considered able associate naturally with Quadrant I forms, in that both have positive pressure and positive wave speeds. [Their specific densities, however, are opposite in sign].

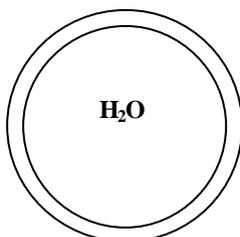
Clearly, the UF in Quadrant II has properties that are remarkably similar to those listed in Section 3 for the human soul, namely, dynamic energy form, stability of form, non-materiality since its energy is not a compressed energy of ordinary matter, intrinsically un-quantified, intelligent since it always seeks order and design, and rejects or resists disorder or random meaningless variability.

These findings may be further summarized by comparing the structures and natures of (1) a non-living micelle or lipid-covered water droplet, (2) a plant or animal cell and (3) a human cell.

**(1). Micell or Lipid-covered Water Droplet**

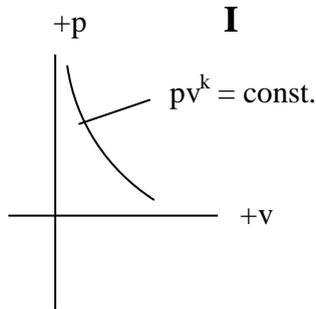
?

**Properties**



Simple 'cell' wall  
Aqueous with random mineral species in solution

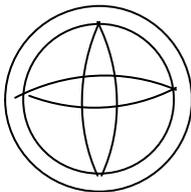
No fixed size. size determined by relative humidity and surface tension  
 Minimum interior complexity  
 Non-living, non-reproducing



Equation of state has form  $pv^k = \text{const.}$   
 (Quadrant I)  
 Internal deBroglie waves in aqueous fluid  
 Pressure, specific volume, density, temperature  
 and pressure energy are all positive  
 Entropy change  $dS = dQ/T$  is always positive and  
 2<sup>nd</sup> Law holds

**(2) Animal (plant) Cell**

**Properties**



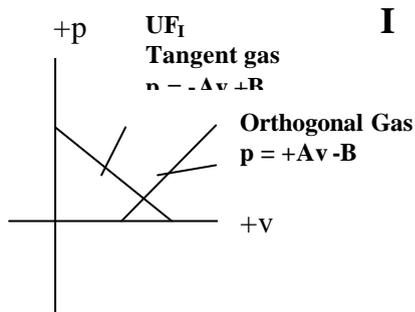
Complex cell wall  
 Aqueous with complex inclusions(Nucleus,  
 orgnelles,  
 DNA/RNA etc)  
 Cell size 20-30 micrometers  
 Great interior complexity  
 Living and reproducing

Supports enclosed UF<sub>II</sub> standing wave forms in Tangent gas and  
 Orthogonal (isothermal) gas

+B

(Quadrant I)

Eqn. of state: Tangent gas  $p = -Av$

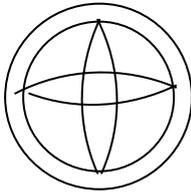


Pressure energy positive +pv

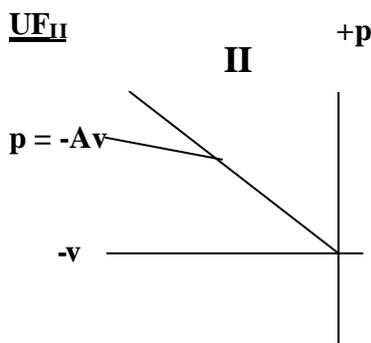
Eqn. of state: Isothermal  
(Orthogonal) gas  $p = +Av - B$   
Entropy change in the Tangent gas,  
 $ds = dQ/T$  is positive,  
Entropy change in the Isothermal  
(Orthogonal) gas is zero,  $ds = 0/T = 0$   
Pressure positive +p  
Specific volume positive +v  
Specific density positive +? (i.e. Wave forms compressive)

### (3) Human Cell

#### Properties



Complexity, wall, size, contents generally same as animal cell



Enclosed standing wave forms are now UF<sub>II</sub> forms with following properties

Equation of State:  $p = -Av$  (Quadrant II)  
Temperature is negative  
Entropy change  $dS$  is negative:  $dS = dQ/(-T)$ ; [ i.e. implies Rationality]

Pressure is positive +p  
Specific volume is negative -v  
Specific density is negative -? (i.e. Wave forms are rarefied or 'non-material')

## **6. Conclusions**

It has been shown that a formal agreement exists between the physical attributes of the  $UF_{II}$  from science and the rational attributes of the concept of the human soul from traditional western philosophy.

In classical, mediaeval and even into Enlightenment times, such a finding would have called up interest, evaluation and rational discussion. In our times, however, it may at first appear excessive in (a) novelty and (b) simplicity. The novelty should fade quickly in the light of history; the simplicity may be an advantage in promoting wider critical evaluation

Philosophy should be able to evaluate this new possibility as it does any new scientific input. Interested practicing scientists, hopefully, will concentrate on an extended, critical scientific examination of the physical properties of the UF – in all of its four quadrants.

Finally, as with all science, the viewpoints expressed are subject to revision with the advent of new understanding and new data.

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