The Soul/ Body Problem: A New Proposed Solution—Wave Interaction Dualism

"To attain any assured knowledge about the soul is one of the most difficult things in the world."

"….with what facts shall we begin the inquiry?" ***Aristotle. On the Soul. Book 1, Chapter 1***

A new set of scientific facts for consideration by Philosophers of Mind and Neuroscience

Contents

Abstract

A solution, expressed in scientific terminology, to the classic philosophic problem of the Dualism of Soul and Body is offered by the introduction of a physical wave behavior to the soul when it is embodied, so that a new unity emerges.

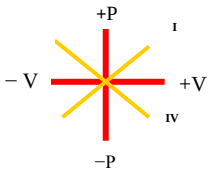
The wave/particle example from quantum physics is only partially dualistic since it is the unified interaction product of a physical wave speed and a physical particle velocity. The new soul/body wave analogue is the unified, and at the same time dualistic, interaction product of an immaterial soul wave speed c and a bodily motion V.

The proposition is explored that the spiritual, human soul, in its association with the body, obeys the fundamental classical wave equation of physics exactly, whereas, in physics itself, only approximations to it are observed.

The new wave interaction approach is presented as 'a new set of facts' for consideration by the Philosophy of Mind and Neoroscience.

PART 1

Dualism and the Soul/ Body Prlem



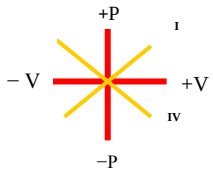
1.1 Introduction

The philosophy of human consciousness and intelligence, today involves an input of scientific facts from a large number of scientific disciplines, such as neuroscience, biophysics, psychology, information theory and the like.

In classical philosophy, the human or rational animal is described as a creature composed of the union of a material body and a rational soul, The question then arises as to how the two essentially different entities of body and of spirit can join to form an organic unity. We shall attempt a scientifically based solution to this key problem. This is the well defined and well studied problem of **dualism,** of which a classical example has been that of the philosophy of Descartes [1, 2]. He postulated that there were two entirely different substances involved in humans, namely matter and spirit; but then, the objection arose as to how two entirely different entities could be joined to constitute a unity? How could they interact?

The theologian Karl Rahner, S. J. [3,5] argued that body and soul cannot be completely different , otherwise the two could not be joined to form an organic unity. Bernard Lonergan, S. J. makes the same point, from a different perspective, in his *Insight: A Study of Human Understanding.*[4]. These philosophers and theologians argue that the soul, in some aspects, must be similar to matter. **What could these similarities be?**

This question has led us to a search for material forms which an immaterial soul could emulate, or assume the role of, in order to function as a unity in a material body. In this search, the example of the **wave/ particle** conundrum of early quantum physics was considered, and a dualistic, wave- interaction energy term 2cV in a flow energy equation was seen as offering a possible solution.



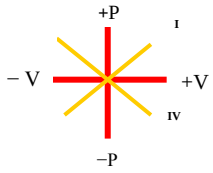
1.2 General Approach to the Dualism Problem

If the soul and body are to interact in an intimate organic unity, then in human physical matters, the soul must participate in the physical activities of the body, and in those instances must be subject to the same physical and chemical laws as the body.

Therefore, some scientific laws must pertain even to an immaterial soul, not intrinsically, but in those physical activities which the soul shares with the body.

Again, the material brain is flooded with the waves, electrical and electrochemical in nature, which pertain to received sensory data and to the intelligibility they contain, transfer and store. An entity which scans and interacts with this material intelligibility in the brain and nervous system, evev if this scanning entity is spiritual, clearly must possess, or assume, properties that relate to matter and to its laws of physical action.

We proceed to offer a solution to this Dualism problem via a comparison with the laws of wave/ particle interactions in quantum physics and in compressible fluid flow, with emphasis on the wave qualities.



1.3 Physical Dualistic Wave Interactions in Quantum Physics and in Compressible Flow ; A Unifying Concept

Example 1: The physical wave/ particle dualism of quantum physics. From its earliest days, a main feature of quantum physics was the question of how the quantum entity (wave function, Ψ) could be, or could represent, both a wave and a particle. Waves and moving particles are dissimilar, but they are alike in both being physical motions. These quantum wave entities thus appear to be dualistic physical entities which are worth study.

In the case of quantum physics, the symbol Ψ, the 'wave function', represents, in the Copenhagen interpretation, a wave amplitude, and the square of this amplitude, $\Psi^{2,}$, is the probability of the particular quantum action taking place, or of the particle being in a particular place. For an **interaction** of two quantum wave amplitudes, Ψ_1 and Ψ_2 , the 'square of the sum' rule applies in computing the desired combined probability, namely

$P = [\ \Psi_1 + \Psi_2\ ]^2 = [\ \Psi_1^2 + \Psi_2^2 + \mathbf{2\ \Psi_1\ \Psi_2}\ ]$. Here, a dualistic or mixed wave function 'interaction' term appears as [**2 Ψ_1 Ψ_2.**].

Example 2: Wave/ pulse Interaction Energy

Another example of wave particle **interactions** lies in compressible flow physics. Such flows have a wave speed c (e.g. acoustic waves, acoustic waves of compression or rarefaction, etc.) and a local flow velocity V of fluid. If the particular compressible fluid obeys the classical wave equation, its *wave pulses* then travel at a pulse velocity $(dx/dt)_{I,\ II}$ given by:

$$(dx/dt)_{I,\ II} = c \pm u$$

where u is the component of flow velocity V in the x-direction.

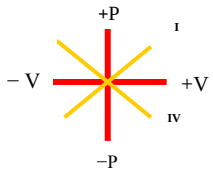
Therefore, the wave pulse specific **energy** (i.e. the energy per unit mass) in the x-direction is the square of the pulse velocity, that is

$$E_{pulse} = (dx/dt)^2_{\ I,\ II} = (\ c \pm u\ )^2 = c^2 + u^2 + \mathbf{2cu,} \text{ and } c^2 + u^2\ \mathbf{- 2cu}$$

where **2cu is the interaction energy** between wave speed c and flow u in the x direction, and in the minus x-direction..

In three dimensions, we have $(\ c \pm V)^2 = c^2 + V^2 \pm$ **2cV.**

We see that these classical wave pulses travel at a velocity sum (c + V), and that the two c and V speeds also interact to produce the the wave pulse energy containing the **interaction energy 2cV** term. This wave speed plus flow speed interaction in compressible flow is the counterpart to the quantum wave/particle interaction; it is also a unity of two dissimilar entities, namely c and V, yielding a 'unity in duality', 2cV, that we shall put forward to support the validity of a Soul /body unity postulate.



1.4 Conclusions

We have outlined a solution to the Dualism Problem in the Philosophy of Mind.

Instead of Soul and Body being completely dissimilar, as with Descartes' formulation, we, by an analogy with quantum physics, **postulate** that the human soul when embodied is energetic and can (1) assume an energetic form consistent with the classical wave equation and its unique linear equation of state, and can (2) interact with the various kinetic particulate and mass motions and fluid flows of the human body, so that it produces an interaction energy **2cV** which constitutes an intimate "unity in duality", thus resolving the soul/body duality problem.

More complete scientific details will be presented in **Part 2: Wave/Particle Physics and Soul/Body Wave Interaction Dualism in Humans**

References and Notes

1. Descartes, Rene. Meditations on First Philosophy. U.of Chicago . The Great Books. No. 31. Encyclopedia Britannica, Inc. 1952.

2. Grim, Patrick. Philosophy of Mind: Brains, Consciousness, and Thinking Machines. The Great Courses. Chantilly VA., 2008

3. Rahner, Karl, S.J. Hominisation: The Evolutionary Origin of Man as a Theological Problem. Herder and Herder, New York, 1965.

4. Lonergan, Bernard J. F., S.J. Insight: A Study of Human Understanding. Philosophic Library, New York. 1956.

5. Rahner [3], as an example of possible similarity between spirit and matter, wrote " matter ---- considered as a sort of solidified spirit". The science of today , however, points to a position that matter is, instead, much more likely to be 'condensed energy'. See www.energycompressibility.info .

On this point also, Lonergan in *Insight*, raises the possibility that energy may relate to the classical philosophic concept of 'prime matter'.

6. In the case of Man, we take the position that we are dealing with an animal whose mental activity relates to, not only basic intelligibility in physical data as with all animals, but also, uniquely, to the higher levels of consciousness and thought, that is to such things as probability distributions of the basic data forms, their standard deviations , their correlations, and with the myriad higher intellectual human activities involved in the fine arts, the practical arts, academic studies, theories, philosophies and so on. In a word, to human intelligence as opposed to the simple basic detection of the intelligibility in sensory physical environmental data.

This distinction between sensitive animals and man, or between ability to grasp the intelligible versus the ability to be intelligent about the intelligible, is dealt with extensively by Lonergan in his *Insight* [4]. He writes, for example:

1) " …. The distinction between the intelligible emergent probability of prehuman process and the intelligent emergent probability that arises, is the measure that man succeeds in understanding himself and in implementing that understanding."

2) "…. in man there occurs the transition from the intelligible to the intelligent."

3) " ……and so in the limiting case of man, the intelligible yields to the intelligent …"

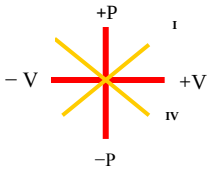
For Lonergan, i***ntelligibility*** is the characteristic mark of material, physical reality, while ***intelligence or understanding and insight*** are the characteristic mark of man.

In Part 2 we go into details on our proposed soul embodiment model. These details will necessarily include some wave and flow physics; the full details on the technical aspect will be sequestered to Part 3, for reference as interest or need dictates.

End of Part 1

PART 2

Wave/particle Physics and Soul/Body Wave Interaction Dualism in Humans



2.1 Introduction

We have, in Part 1 above, countered, in scientific terms, the objections to the philosophic Dualism of classical Soul/Body theories of human nature. This has been done by citing the 'unity in duality'of a wave interaction energy, 2cV, analogous to the wave/particle 'unity in duality' of quantum wave/particle mechanics.

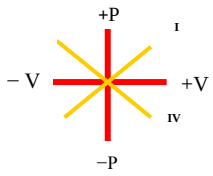
Here In Part 2, we give more detail on this **soul/body wave interaction dualism.**

The true nature of Man certainly has been a matter of deep controversy and mystery. On the one hand, there are the overwhelming facts of human intelligence, thought, theoretical solutions, academic and artistic activities, technologies, social talents and civilized achievements which today reach out through space to encompass the entire universe and which must be accounted for. If these realities are to be acknowledged and explained, they require a mental or spiritual reality, incontrovertibly unique to Man, and more or less in line with the conclusions of the classical Philosophy of Mind.

On the other hand, there are the mounting facts of neuroscience which have demonstrated in great detail the role of physical brain complexity in human mental processes. These appear to be purely biological rather than dualistic.

What we propose here is that assigning a wave and compressible flow behaviour to an embodied spiritual soul in man, converts a disparate dualism into an intimate unity, one in which the observed facts of both human mental reality and human intricate physicality are each fully acknowledged. The new approach, which we propose to call **wave**

interaction dualism, is also, in principle, open to scientific verification, for example, via the proposed wave behavior and its effects.



2.2 Dualism in Man Let us first look briefly back at the classical position that man is a composite of soul and body, for example, a spiritual or non- material essence and a material, animal body. But then, on this position, while soul and body are similar in that both are energetic, the nature of their energies could be intrinsically different. And so the objection of 'dualism' still arises to be overcome.

Now in the case of Man, we take the position that we are dealing with an animal whose mental activity relates to, not only basic intelligibility in physical data, but also to the higher levels of consciousness and thought, that is to such things as probability distributions of the basic data forms, their standard deviations , their correlations, and with the myriad higher intellectual human activities involved in the physical sciences both pure and applied, in fine arts, the practical arts, academic studies, theories, philosophies, religions and so on. We face the astonishing, incontrovertible facts of human intelligence, as opposed to the simple basic detection of the intelligibility inherent in the sensory physical environmental, and the repetitive stability that is the mark of sensitive, non-human animal behavior.

This distinction between other animals and man, or between ability to grasp the intelligible versus the ability to be intelligent about that which is intelligible , is dealt with extensively by Lonergan in his book *Insight*: *A Study of Human Understanding* [1]. He writes, for examples:

1) " …. The distinction between the intelligible emergent probability of prehuman process and the intelligent emergent probability that arises, is the measure that man succeeds in understanding himself and in implementing that understanding."

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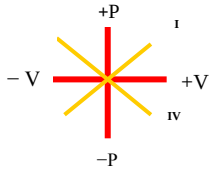
A Solution: Our solution to furnishing a scientific explanation for the mental actions of the embodied human Soul, is that there is an energetic wave/flow interaction unity involved, and so we **postulate** that the embodied human soul exhibits an energetic wave behavior, having wave speed c, and relative flow speed V, which can interact with the kinetic, material, particulate motions and flow velocities V of the physical body.

Since the flow speed V is relative, we can have wave speed c and bodily motion V, or it can be the reverse with body wave c and soul flow V. In each case, the interaction of wave speed c and flow speed V results in an interaction, one yielding a real, dualistic unity of body and soul/wave, with total wave- pulse energy $E_{Total} = [c+V]^2 = c^2 + V^2 + \mathbf{2cV,}$ of which the unifying interaction energy is the term **2cV.**



2.3 A Soul/body Wave Interaction Dualism Suggested by Quantum Wave/particle Dualism

Since we have introduced a wave behavior into the embodied human soul, let us examine the Classical Wave Equation and its linear wave solution. Although this equation is fundamental, we should note that in real physical systems (gases, fluids, thin films, membranes, tissues, etc.) the waves that appear are never the exact classical waves, but are always an approximation. This is because the equations of state of real physical systems are non-linear (usually hyperbolic or hyperboloid) instead of being linear as required for exact classical wave correspondence.

In the case of man, however, we now also **postulate** that the **human soul supports the classical wave equation in its exact form**. This means that the soul assumes the behavior of the linear equations of state $p = \pm av \pm b$. Thus, the soul supports waves of any amplitude large or small, and of either compression or rarefaction, and will propagate them with unchanging form, instead of them growing to shocks or dissipating entirely. This postulate for unrestricted soul waves is coupled with the known ability of the body to propagate in its tissues stable acoustic type waves but only when they are restricted to being of very low amplitude.

Specifically then, we **postulate** for man a scientifically verifiable Wave Interaction Dualism, consisting of (1) a material body and a non-material soul, where the latter interacts with the material body as an energetic (dynamic) wave motion entity, which, being spirit, (2) can obey **exactly** the fundamental classical wave equation and its linear solutions.

2.1 Classical Wave Equation and Its Linear Equations of State

The classical wave equation [2] (for one- dimension x) is:

$$\partial^2 \Psi/\partial x^2 = 1/c^2 \, (\partial^2 \Psi/\partial t^2)$$

The general solution of this is $\Psi = f(x - ct) + F(x + ct)$ which gives a series of sloping straight lines on the x-t depiction of wave progress in space (x) and time (t).

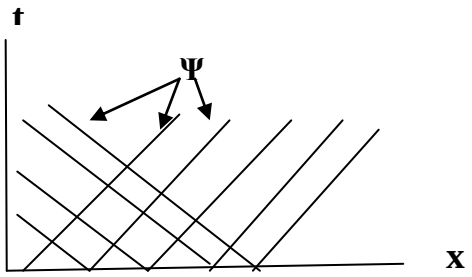


Fig. 1. Lines of propagation of simple waves

2.2 Linear Equations of Stste for Hypotherical Fluids Which Support Classical Waves

Real gases, such as air and liquids such as water, have equations of state describing their behavior (changes in pressure, specific volume and temperature) under expansion or wave motion , which are hyperboloid, whereas linear equations of state are needed to exactly support classical waves.

A theoretical linear equation of state known as the Tangent/Tsien/Chaplygin gas, which would support classical waves, is sometimes used in aeronautics

and cosmology to get around the limitations and restrictions of the hyperboloid, real equations of state. Fig. 2.

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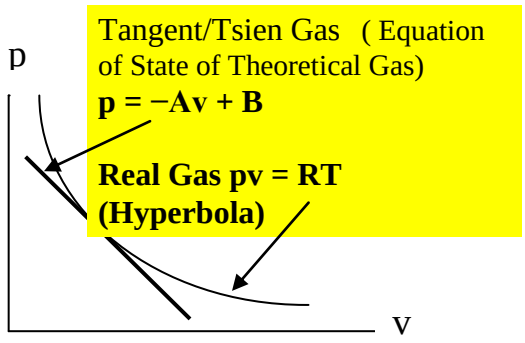

Fig. 2 . Equations of State of real and hypothetical fluids

2.3.1 Linear Equations of State for a Postulated Soul Embodiment Which Support Classical Waves

In its postulated embodiment, the human soul is a wave entity Ψ, exhibiting the thermodynamic properties of two exact linear equations of state:

$$p = -av + b \text{ and } p = +av + b$$

where p is pressure, v is specific volume (or volume of a unit mass ($v = 1/\rho$)) and a and b are constants.

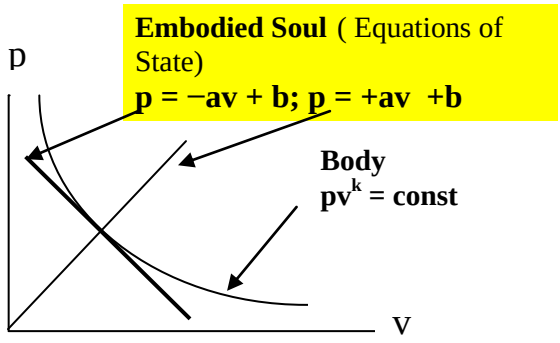

Fig. 3 . Postulated Eqns. of State for an embodied human soul

In the Tangent gas case (Section 2.1 above) a linear equation of state for the hypothetical fluid called the Tsien/Tangent gas p = −Av +B), which is also a solution to the classical wave equation, is placed tangent to the hyperbolic equation of state for a real material fluid. At the tangent point the pv energies of the two

fluids are identical, so their behavior is also then identical.

In the present soul/body case (Fig.3) a linear equation of state, which obeys the classical wave equation and is assigned to the embodied human soul (p = −av +b), is depicted as tangent to some averaged adiabatic equation of state pv^k for human bodily tissue. Another linear equation of state (p = +av +b] also obeying the classical wave equation is orthogonal to the tangent case.

If the constant intercept (b) in the two equations of state p = ± av ± b is zero, then the equation lines pass through the origin of the pv coordinate system (Fig 2 a) and reduce to:

$$p = \pm av.$$

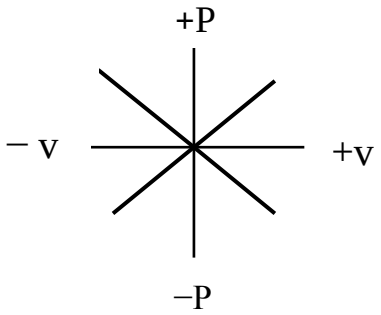

Fig. 2a.. Equations of State for linear solutions of the Classical Wave Equation (p = ± av) passing through the origin (i.e. when the intercept (b) is zero.).

2.3.2 Wave/ pulse Interaction Energy (2cV)

In the classical wave equation, wave pulses travel, in the x-direction, at a total speed of c the wave velocity plus a flow speed u [2]

$$(dx/dt)_{I, I} = c + u$$

where u is the component of the flow speed V in the x-direction [2].

Therefore the wave pulse specific energy in the x-direction is the square of the pulse velocity, that is

$$E_{pulse} = (dx/dt)^2_{I, II} = (c + u)^2 = c^2 + u^2 + 2cu$$

where 2cu is the **interaction energy** between wave speed c and flow u in the x direction.

For three dimensional with velocity V, we have wave pulse energy

$$E_{pulse} = (c + V)^2 = c^2 + V^2 + \mathbf{2cV}.$$

2.3.3 Wave Speed c

The wave speed c is given by

$$c^2 = (dp/d\rho);\ c = (dp/d\rho)^{1/2}$$

For the equation of state $p = -Av + B = = -A\rho^{-1} + B$ we get, by differentiating for $dp/d\rho$,

$$dp = -(-1)\, A\rho^{-2}\, d\rho, \text{ so that}$$

$$c^2 = dp/d\rho = +A\,\rho^{-2} \text{ ; and } c = +A^{1/2} / \rho = +\, A^{1/2}\, v$$

Thus, for the linear wave equation $p = -Av + B$, and we see that the wave speed c is positive and real .

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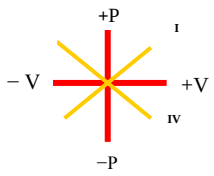
For the orthogonal linear equation $p = +Av + B$, the wave speed c becomes ***complex***, namely (ic), and the interaction energy becomes 2icV.

This ***complexity*** indicates that the wave pulse may ***resonate***. This resonant wave behavior could be important in the study of such soul properties as affection, sense of satisfaction accompanying intellectual insight, etc. .

In this model, the soul is postulated, when embodied, to supply a wave action of the exact classical wave kind, and to interact with bodily kinetic motions to produce an intimate dual energetic unity [2cV. 2icV]. This union of soul with matter is described by the energy interaction. The soul- in- body is now a unified seat of consciousness, intelligence, creativity and affinity directed towards the Greek triad of desirables: 'The Good, The True and The Beautiful'.

With the wave and wave interaction hypothesis or postulate, we have taken a first step towards describing the human dualistic interaction in scientific terminology. Other aspects of the soul/ body interaction remain to be studied and described. For example, let us look at **soul motions.**



2.4 Human Dualistic Interactions and Wave Motion : *"The Feast of Reason and the Flow of Soul"*

Of the two motions (velocities c and V in the 2cV Dualistic energy term) the bodily motions V are more readily understood. Wave motions in fluid are also easily grasped. But, for waves and flow in spirit , we have to make some effort to properly grasp what is involved.

2.4.1 How does the soul move the body?

We have started this inquiry into the Soul/Body interaction dualism by an analogy with quantum wave/particle dualism. The 2cV energy was derived as a concept from fluid mechanics. Let us then try and continue by looking at the problem of soul and body motions from the standpoint of the formalism of the mechanics of motion.

2.4.2 Soul Motion and Force We have characterized the motion of the soul as a wave motion of speed c. Now in mechanics, by Newton's First Law, force arises from an acceleration. Let us then continue our soul/body investigation by defining *Soul Force* as *an **acceleration** in soul wave speed c.* Thus, we would then have:

Wave Acceleration = dc/dt ,
Force = ma = ('density' measure) x acceleration .

Force has physical dimensions of energy /distance, i.e. E/l. Therefore, if we are dimensionally correct, we should also have

$$2cV/l = E/l = \text{Force.}$$

But, force is proportional to an acceleration (F = ma), and so let us check our 2cV interaction energy term again

$$2c(l/t)/l = 2c/t = 2 \times \text{wave acceleration}$$

Wave Force = $E_\Psi /l = 2cV/l = 2c/t = 2$ (wave acceleration) (unit 'density' parameter).S

We tentatively conclude, therefore, that we can define Soul **Force** as Wave acceleration (dc/dt) multiplied by a unit 'density' parameter. (Here, the acceleration is a 'specific acceleration')' so that numerically its value is 1, and it does not appear specifically in the equation for force. i.e. F = dc/dt (1).)

Thus, we are dimensionally consistent with our soul assumptions, as formulated, and can now proceed to define soul motion in relation to the human body in terms of wave speed c, and Soul force in terms of wave acceleration dc/dt.

Accelerated soul motions or impulses could conceivably pertain to such things as soul action, decision, attraction to, affection for, love of, etc. This soul wave/ acceleration, dc/dt, recalls the Poet's 'flow of soul' . This formalism matches the principles of classical mechanics that apply to the body and further exemplifies a 'unity in duality' of soul and body.

Any 'soul motion' whatever thus interacts with the body via the force of an accelerated wave pulse relationship 2cV, and a soul/body interaction occurs. In turn, any bodily motion whatever also interacts with the soul via an accelerated wave action and again a force is generated. In this way, soul and body would act and move as a unit at all times., but retaining their essential or intrinsic nature – the body being material and the soul intrinsically spiritual.

We should perhaps note that in this model, even motions as spatially miniscule as atomic or molecular vibrations would interact to fundamentally knit the soul and body together into the dualistic 2cV unity.

2.4.3 The Problem of Consciousness: A Suggestion for Neuroscience and Philosophy of Mind

The problem of consciousness, or the sense of self awareness, remains one of the most perplexing in neuroscience and the Philosophy of Mind. We are suggesting a ***role of wave interactions*** in the matter.

In our proposed model, any motion, whether of soul- wave acceleration or of bodily motion, generates a mutual interaction, pulse energy linking soul and body in an intimate continually renewed interaction energy, 2cV. In this all

pervasive interaction energy, we suggest, may lie the source of the sense of 'self awareness', and the origin of consciousness. .

2.2.4 Theory Validation and Further Relevant Questions

In the working out of valid insights [1] the ongoing steps are, first, a searching, reasoned examination of the model which has emerged to solve the dualism problem. In the present case this would seem to include a scientific verification via the proposed wave interaction effectand the unrestricted wave amplitude characteristic.

Following this, if the insight is reasonably supported, various further relevant questions automatically arise in the informed and inquiring mind to be investigated [4]. Among these, the nature and action of love is undoubtedly foremost, an evaluation of which will welcome the attention and collaboration of both ' saints and scholars'.

One of these further relevant questions would also likely be a new look at the differences and similarities between man and other animals.

2.4.5 Differences between Man and Other Animals: Some General Considerations

This is of course a very large topic, which we shall only touch on here, and only in very general and illustrative terms.

For our very general descriptive approach, let us consider the case of the North American Beaver, sometimes considered as the 'engineering animal'. It lives in domed hut, constructed of interwoven tree branches, in a lake; the hut has a hidden underwater entrance, and an inner, dry, earthen floor built up above the lake water level. The water level in the lake, and so also inside the beaver hut, is controlled by a dam at the lake outlet built of tree branches plastered with mud. In many cases, the little lake is actually formed by the beavers having constructing their dam across a small stream.

The combination of elements in this animal abode is astonishing, especially the lake-level-controlling dam. The ensemble of elements seems to show clear evidence of design. The impression that the animal is exhibiting 'intelligent design' is strong.

And yet, the ingenious beaver also exhibits the universal animal attribute of endless repetition. The habitation and dam construction is always the same. This suggests social evolution rather than invention. All animals have repetitious, extremely conservative behavior. Genetic control, plus parent- to-offspring rote learning seems the rule. Thus, the natural selection of a long chain of small, fortuitously favorable environmental occurrences, coupled with a drive to seek their own good, could perhaps account for the beaver's apparent design originality. This, coupled with extreme animal stability of 'design', could produce the behavior that is observed..

Turning to man, a striking difference from beaver behavior is that man's interaction with his environment is marked by extreme variability and constant innovation. It is almost completely the opposite to the non-human animal pattern of repetitive, extreme stability. It is innovation versus conservation, and extroverted curiosity versus self -centered curiosity. It is the question : . 'What is this to me?' versus What is this and Why? Animals are curious and stable. Humans are curious and inventive, they are changeable socially, even revolutionary, and their innovations are not at all limited to adopting chance occurring, useful environmental variations, but rather they spring from insight into universal, immaterial, principles of a science.

The environmental sensory data are scanned and used in a brain whose scanning nature is central. In animals, the result is self centered. In man, the scanning is 'insight- seeking' or intelligent. Thus ,there is an <u>essential</u> difference with humans. We have suggested that this essential difference includes the wave action of an immaterial, intelligent, energetic entity – the human soul.

For a second example, let us consider, say, a watercolor painting of the *aurora borealis*. As a concrete material object, it is a combination of various colors and shapes on a paper base. As a human, artistic artifact it is an abstraction of sensory images, of memories of aurora borealis events, the image areas show variations, shades, forms, paint brush marks, sharp color edges, blurred ones, colour mixings, composition, pleasing and unpleasing combinations, contrasts, etc. All concepts are clearly abstractions. It embodies both hope of artistic success and faults in technique, concept and finish.

If we were now to show this watercolour to our beaver, he will undoubtedly sniff it, touch it, and, since it is paper, he will probably try and eat it. He might possibly even use it to patch a leak in his dam.. Clearly, its concrete

material aspects or intelligibility are his only interest or comprehension. The artistic, mental and human elements , which really make up the watercolour simply do not register with the beaver. It is not something for him to keep and ponder, or to enjoy. Such behaviour is not in his nature. The beaver is environmentally pretty successful, but he is definitely not the 'soulful type'.

Because of the hitherto unsolved problem of dualism, the vast 'preponderance of evidence' of the Philosophy of Mind that points to a non-material human essence has, over the past century, gradually become negated in practice, not by fact or reason, but by mere disregard, in favor of a vague expectation of eventual explanation by massive, but logically irrelevant, brain complexity. The result has been a serous, debilitating confusion in human civil, religious, intellectual and ethical affairs.

The fact that a serious scientific solution can now be offered to solve the Dualism objection would appear to reverse the situation at once. An interaction Dualism can no longer simply be rejected, and other scientific reconciliations of the sort can always be proposed. Therefore, the position of the Philosophy of Mind as central in the controversy appears reestablished, it being based on the massive preponderance of unquestioned evidence as to human creative behavior requiring acceptance and explanation.

Simply put, if science deals with the nature and functioning of the Body and philosophy deals with the nature and functioning of Mind, then the proposed dualistic wave interaction union of Body and Mind would appear to constitute a new joint arena of interest and interactive research where science is now required in Mind as it is in body.

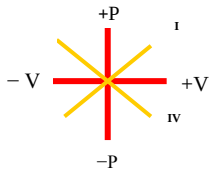
2.4.6 Fully Human Soul/ Body Dualism

We have proposed, and started to describe in scientific terminology, what we characterize as 'fully human action', which is an energetic, fully integrated, soul/body dualism. One has only to conjure up some human social gathering --- one involving, say, some family, academic, political, sporting, artistic, or religious 'Feast of Reason and Flow of Soul" event, in order to make it clear at once what this fully human experience is, and what is involved in a postulated energetic, dualistic, body and soul human nature.

If as we contend, human reality is a composite, then it poses its peculiar dualistic challenge to being understood, especially when the task of

integrating the physical and spiritual within a proper scientific formalism and terminology is then required.

The explanatory, interactive, dualistic, wave model proposed can perhaps usefully be viewed as constituting a 'new set of facts' for consideration by the Philosophy of Mind and Neuroscience.



2.5 Conclusions

(1) We have presented a new argument against rejecting all forms of soul/body dualism by adopting an approach in which the spiritual is postulated to be able to configure itself so as to provide a soul/body wave **interaction dualism.**

At the same time, we have reiterated our view of the impossibility of explaining the overwhelming reality of the unique, abstract, mental, immaterial, insightful, intellectual, creative, original, artistic, and spiritual human life by any conceivable complex molecular materialism.

(2) Our model requires postulates (a) that the human spirit or soul be able to interact in an energetic, wave-like, dualistic manner with the human body and vice versa, (b) that all motions of either soul or body produce energetic 2cV, 2icV, type interactions, and (c) that the wave motions of the soul conform to the exact classical wave equation.

(3) The dualism is with the soul's 'wave and flow', c and V, on the one hand, and the body's wave and flow .c and V, on the other. The unity is in a common, combined energy of interaction **2cV or 2icV** as described by the energy equation $\mathbf{E_{total} = (c + V)^2 = c^2 + V^2 + 2cV.}$

Since the human soul, as postulated, is spirit, its wave action is contingent on the soul being embodied, and is not to be considered intrinsic, nor is the embodied soul to be identified with the physical materiality of the human tissue with which the soul intimately interacts in dualistic wave pulses.

Clearly, such an interaction resulting in a 2cV (2icV) energy, constitutes an intimate union, and the entity corresponding to it would necessarily act as an

organic unity. Both soul and bodily energies are present, but in a new interaction unity. It is believed that this approach solves the philosophic Dualism problem for soul/ body theories within a valid scientific formalism.

This argument asserts that the human essence, while spiritual, has, in its action, the dynamic properties of a physical wave so it can interact with the bodily flow energy. There is as yet no experimental proof of the wave interaction; and so, for the moment, it rests on its general reasonableness in fitting the known facts of human intellectual life. In principle, however, the soul/wave proposal would seem to be scientifically verifiable, for example through the asserted wave interaction. Verification must await the examination and assessment of neuroscience.

The fact that it can be proposed at all, however, may now philosophically negate any blanket objection to dualism, since physical interactions other than wave action may , in general, also be advanced, to be countered as they are put forward.

(4) We can now also put forward the presence of this interaction energy of soul and body, [2cV, 2icV], as a potential solution to the 'hard problem of human consciousness ' in neuroscience and in the Philosophy of Mind.

(5) The main implications of the Wave Interaction Dualism appear to be twofold: (1) it presents a solution to the Dualism Problem, and (2) it offers to neuroscience new possibilities, such as new sets of waves and wave interactions , e.g. , waves of compression, of rarefaction, standing waves, group waves, resonant complex waves which may interact, for example, with electrochemical neurotransmitters.

We have presented these items as' a new set of facts' for evaluation by the Philosophy of Mind, and as a new` application of physical science to the realms of neuroscience. Hopefully, this may help bring about an enriched awareness and enjoyment of "The feast of reason and the flow of soul" in human affairs.

References

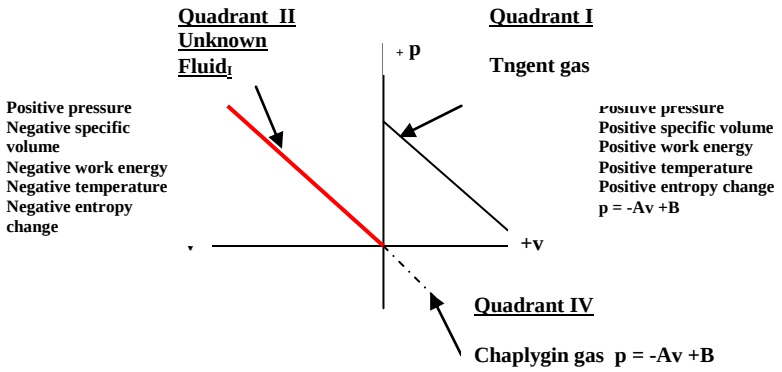
1. Lonergan, Bernard J. F., S.J., Insight: A Study of Human Understanding. Philosophic Library, New York. 1956.

2. Shapiro, A.H., *The Dynamics and Thermodynamics of Compressible Fluid Flow*. 2 Vols. John Wiley & Sons, New York, 1953.

3. Lonergan in *Insight* [1] writes : " … material reality cannot perform the role or function of spiritual reality but spiritual reality can perform the role and function of material reality."

4. In 2007, , a preliminary look into the properties of Quadrant II was undertaken. Shortly before that time, cosmologists had extended the Chaplygin/tangent gas equation into Quadrant IV in order to get a negative that would serve to explain the newly observed acceleration in the expansion of the universe.

The result of the 2007 investigation was the finding of a negative density and specific volume, and a negative entropy in the Quadrant II depiction of pressure-volume equations of state. This was interpreted in a preliminary fashion as in the following excerpt:



Excerpt from 'Science and the Soul/Body Problem " 2007

[Posted in: www.shroudscience.info 2008]

" The UF :(Universal Field) 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 2nd law of thermodynamics pushes inexorably towards disorder and random variability, in the UF_{II} the stable forms are oriented towards order, design and pattern. This intrinsic orientation points towards the UF_{II} 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 = const. by definition. Even the UF's Tangent gas has limits set by the constant B].

(7) The UF_{II} forms might be considered to be 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 and subsisting, non-materiality since its energy is not a compressed energy of ordinary Physics or of any ordinary physical matter, intrinsically un-quantified, intelligent since it always seeks order and design, and rejects or resists disorder or random meaningless variability.."

Currently, (2015) we would be more inclined to assign the Quadrant II peculiar and interesting negative physical properties, not primarily to a soul embodiment, but rather to a physically rarefied, exotic or hypothetical scientific " other world" existence.

This Quadrant, rarefied, exotic, physical matter could, of course, also be assumed able to be taken into a soul/body embodiment by a spiritual essence or soul , just as we have Postulated for Quadrant I matter in order to explain the intellectual side of our present human existence. Quadants II, III, and IV deserve further careful examination, especially if the model proposed for Quadrant I is scientifically verified.

End of Part II

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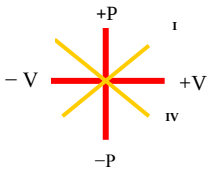
PART 3

Wave Interactions and Compressible Flow

3.0 Introduction

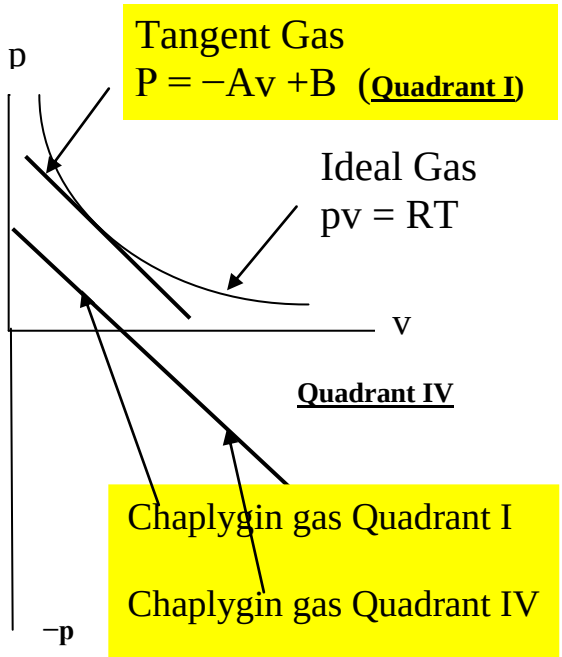
Our proposed solution to the problem of Dualism in Part 2 involved a **wave interaction energy 2cV**. The waves we are interested in are ***compression pulses in a compressible fluid***, i.e. in a fluid capable of experiencing density variations and having a finite and variable wave speed c, (as opposed to incompressible fluids where the wave speed is theoretically infinite). Specifically, these compression waves are called acoustic or 'sound' waves and are described by what is called the Classical Wave Equation.

This equation will be derived below. It is the description of all stable propagating waves of compression or rarefaction and of any amplitude, large or small. In compressible flow physics, the two equations of state for theoretical gases that support exact classical waves are called the Tangent/Tsien/Chaplygin Gas and the Orthogonal Gas



3.1 Compressible Flow

The physics of compressible flow [1,2] embraces many fields, such as, hydromechanics, aeronautics, meteorology, jet flow, rocket propulsion, astrophysics and cosmology. Compressible flow is intimately linked to fluid wave motions.



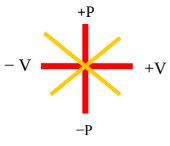
Its equations of state, describing known, physically real gases, are usually plotted in Cartesian coordinates on a pressure- volume or pv-energy diagram in Quadrant I, where the thermodynamic variables of pressure p, density or specific volume ρ=1/v , temperature T and

pv-energy are all positive quantities. With one exception, the equations of state of gases linking pressure and specific volume (i.e. of a volume of a unit mass of gas $v = 1/\rho$) are *hyperbolic* curves on the pressure-volume diagram, for example the Ideal Gas, atmospheric air, oxygen etc..

The exception is a hypothetical, or exotic compressible fluid called the Tangent Gas [3]. Its **linear** equation of state ($p = -Av + B$) was formulated in 1939 by H.S. Tsien in Quadrant I on the Cartesian pressure-volume energy diagram for aeronauticPs and rocket propulsion, and, in a slightly different form ($p = -Av$) had already been formulated in 1904 by S.A. Chaplygin [4] for application to aeronautical problems of jet flow and lift.

An extension of this linear Chaplygin gas equation [$p = -Av$] was made in 2001 from Quadrant I into Quadrant IV in order to obtain a cosmic flow with the negative pressure needed to explain the observed acceleration in the rate of expansion of the Universe [5,6,7] .

This Part 3 will outline the pertinent background physics of compressible fluid flow and its equations of state.



3.2 Compressible Fluid Flow

Compressible fluids change their shape and their density more or less readily. Those which are very compressible are called gases. Since they are subject to density changes as their pressure varies, they exhibit pressure waves of various sorts. Their physics [1,2] embraces compressible fluid mechanics, aeronautics, meteorology, jet flow, rocket propulsion, astrophysics, shock waves, supersonic flow, cosmology, etc.

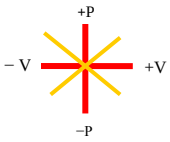
The quality of compressibility makes possible a wide variety of behavior in gases. Because of it, pressure waves are possible;, for example, acoustic or sound waves, shock waves , etc.. The same physical principles also extend to quantum waves.

In known, or real gases, only compression waves are persistent, rarefaction waves simply attenuate and die out. However, no known real gases will support waves of a finite amplitude --- such waves grow to compression shocks instead. Only very low amplitude waves, known as acoustic or sound waves, can travel unchanged for any length of time in real gases. One

theoretical gas, however, known as the Tsien/Chaplygin gas or Tangent gas, is unique in that it can support finite amplitude waves of either compression or rarefaction which remain stable. Expressed another way, we say that 'these two linear gases (p = −Av +B) obey, or support, the classical wave equation'.

The equations of state of most real gases (linking pressure, volume, density and temperature) are hyperbolic, (e.g. pv = RT) and are depicted on the Cartesian pv-energy diagram in Quadrant I.

The two principal hypothetical or exotic gases--- Tsien's Tangent Gas and Chaplygin's negative pressure, cosmological gas---- actually have the same linear equation of state, [p = −Av +B].

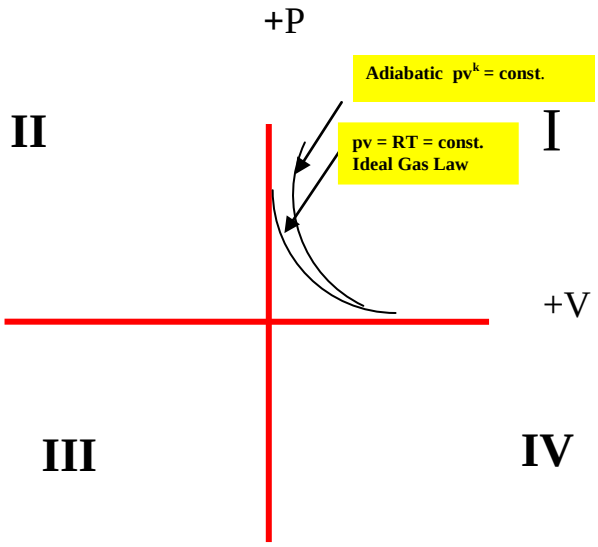


3.3 Equations of State of Gases

A. REAL GASES (Compressible fluid systems)

1. The **Ideal Gas: Isothermal expansion** **pv =constant = RT (Hyperbolic curve)**

2. Adiabatic expansion: pv^k = constant (Hyperbolic curves)



The p-v plots of both of these real gas types are hyperbolic curves.

Figure 2. Cartesian plot of pressure –volume equations of state

in Quadrant I for the real Ideal gas and its adiabatic expansion

In the adiabatic expansion equation, pv^k = constant, **k** is the ratio of the specific heats [**k** = $c_p/c_{p.}$]. For ordinary atmospheric air, k has the value of 1.4.

The equation of state variables are pressure (p) and volume per unit mass (v = 1/ρ, where ρ is the fluid density).

B. HYPIOTHETICAL GASES

1. Tangent Gas / Tsien's Tangent Gas : p = −Av + B (Linear; wave speed c is real and positive). k = −1

2. Chaplygin's Gas : p = − Av+ B (Linear; wave speed c is real and positive). k = −1

3. Orthogonal Gas (Isothermal): p = +Av +B (Linear; wave speed is complex ic). k = +1

As we shall see, the plots of the equations of state of these three exotic or hypothetical gases, linking pressure p and specific volume, v= 1/ρ , are linear, i.e. are all simple **straight lines** on the pv-energy diagram.

3.4 The Tangent Gas Equation of State; Unique Linear Fit to the Classical Wave Equation

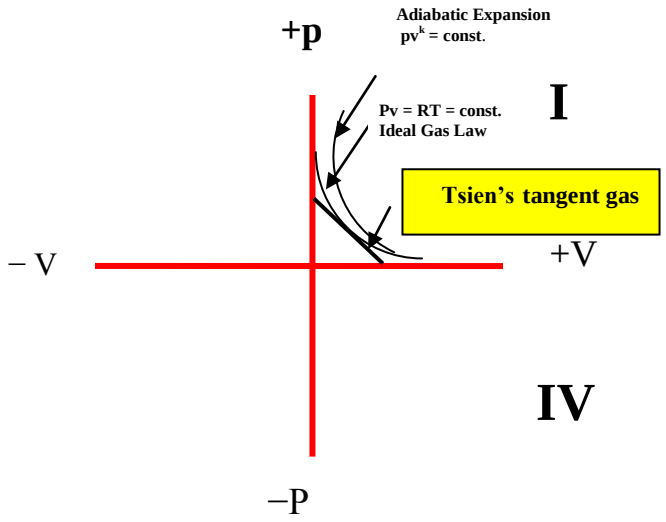


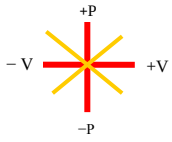
Fig. 2. Tsien's Tangent Gas [p = −Av +B] in Quadrant I

This relationship in aeronautics was formulated in 1939 by Prof. H.S. Tsien, co-founder of the Jet Propulsion Laboratory at Cal Tech, who is also known today as the Father of Chinese Rocketry. His equation is called the "**tangent gas"** [1] **(**Figure 2).

This tangent gas describes the behavior of a theoretical fluid whose linear equation of state [$p = -Av + B$] is placed on the pv-energy diagram so as to lie tangent to an ideal gas equation of state , or to an adiabatic expansion equation [Fig.2].

Since hyperbolic curves are somewhat difficult for manual computation, Tsien in 1939, in the age of slide rule calculation for engineering work, well before the general use of computers, introduced this simple approximate method consisting of drawing a tangent line [$p = -Av + B$] to the hyperbolic curves at any desired point. At or near such a tangent point on the ideal gas or the adiabatic expansion curve, his 'tangent gas' straight line gives results very close to those of the hyperbolic real gas curve.

The Tangent gas approximation is unique (1) in that its equation of state describes the only known fluid, real or theoretical, which supports stable compression waves of any amplitude [1,8], that is to say, it will theoretically propagate finite amplitude waves of expansion and compression without them becoming unstable and growing to shock waves. This is in contrast to known or real gases, such as the ideal gas or the adiabatic expansion gas, in which waves of finite amplitude either die out, or grow unstably to become compression shocks. The tangent gas (Tsien/Chaplygin gas) is also unique in (2) satisfying the classical wave equation exactly, without the approximations required for real gases.



3.5 The Tangent Gas and Quantum Physics Wave Equations

Quantum physics describes the world of the very small, namely that of the atom and elementary particles of matter at a space dimension of around 10^{-9} m.

Atoms and elementary particles are described, not as point particles of matter, but instead as wave packets having a finite dispersion in space. An atom for example is at once a particle and a wave.

The wave equations describing the nature and behavior of the atomic and sub-atomic quantum world are derived from the classical wave equation as a base,

In quantum physics, various wave/particle equations are then added to the classical wave equation to obtain probabilistic wave/particle equations

describing the probable location of the particle in space and its various quantized` energy levels. For example:

as shown above, the classical wave equation is (for one dimension x):

$$\partial^2 \Psi/\partial x^2 = 1/c^2 \, (\partial^2 \Psi/\partial t^2)$$

The Klein-Gordon equation for a spin-less particle is:

$$1/c^2 \, (\partial^2 \Psi/\partial t^2) = \partial^2 \Psi/\partial x^2 - (mc^2 /h^2) \Psi,$$

so that, if the mass m is set to zero, the Klein-Gordon wave/particle equation reduces to the classical wave equation.

In a similar manner, the other quantum wave/particle equations, such as the Schrödinger equation are derived.

Our point here is that a basic, starting wave equation for quantum physics is the classical wave equation.

The wave interactions that go on in quantum physics lead to interaction energy terms 2cV in the energy equations of quantum physics. We have then used this quantum physics example of wave energy unity 2cV emerging from an interaction duality, to clarify and focus the argument in the Dualism debate in the Philosophy of Mind.

3.5.1 Wave/ pulse Interaction Energy 2cV

In the case of the classical wave equation, the wave pulses travel at the sum of the wave speed c plus the flow speed u (or V)

$$(dx/dt)_{I, I} = c + u$$

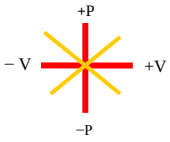
where u is the component of V in the x-direction.

Therefore, the wave pulse **energy** in the x-direction is the square of this pulse velocity, that is

$$E_\Psi = (dx/dt)^2_{I, II} = (c + u)^2 = c^2 + u^2 + 2cu$$

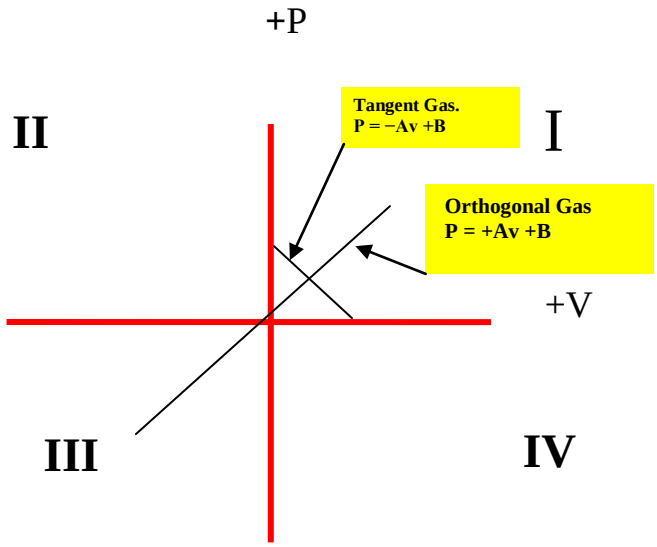
and 2cu is the interaction energy between wave and flow in the x direction.

In three dimensional flow we have then, $(c + V)^2 = c^2 + V^2$ **+2cV.**



3.6 The Orthogonal Gas: (Isothermal):

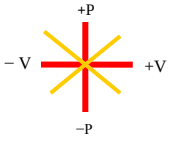
This is a new formulation of a theoretical gas, orthogonal to the Tangent Gas and with much the same properties, which has a complex wave speed (ic) and may have special pertinence to the theory of the functioning of the human Mind, since it involves resonance.



Equation of State

P = +Av +B

Wave speed is complex, ic



3.7 THE CLASSICAL WAVE EQUATION :

Lamb [8] gives a complete 1-dimensional derivation of the classical wave equation as follows:

If the pressure p is a function of the specific density ρ only we have, without approximation

$$\partial^2\psi/\partial t^2 = (p^2 / p_o^2)\ dp/dp \quad \partial^2\psi/\partial x^2 \qquad (1)$$

On the isothermal hypothesis that $p/p_o = \rho/\rho_o$, this becomes

$$3\partial^2\psi/\partial t^2 = p_o / \rho_o \ \partial^2\psi/\partial x^2 \ / [\ 1 \ + \partial\ \psi/\ \partial\ x\ ]^2 \text{ for isothermal expansions} \qquad (2)$$

On the adiabatic hypothesis $p/p_o = (\rho/\rho_o)^k$, Eqn.1 becomes

$$\partial^2\psi/\partial t^2 = k\ p_o / \rho_o \ \partial^2\psi/\partial x^2 \ / [\ 1 + + \partial\ \psi/\ \partial\ x]^{(k+1)} \qquad (3)$$

For $k = c_p/c_v = -1$, Eqn 3 becomes **the classical wave equation**

$$\partial^2\psi/\partial t^2 = k\ p_o / \rho_o \ \partial^2\psi/\partial x^2 \ = c_2 \ \partial^2\psi/\partial x^2 \quad \text{or}$$

$$\boldsymbol{\partial^2\psi/\partial x^2 = 1/c^2\ \partial^2\psi/\partial t^2} \qquad (4)$$

which is uniquely satisfied by **the Tangent gas,** whose equation of state is $p = -Av + B = -A/\rho + B$.

The **Orthogonal Gas** equation at right angles to the Tangent Gas on the pv-diagram , namely $p = +Av + B$, is also a solution to the classical wave equation.

If the constant intercept B in these two equations of state is zero, then the equation lines pass through the origin of the pv coordinate system (Fig 1)and reduce to

$$[\ p = \pm Av].$$

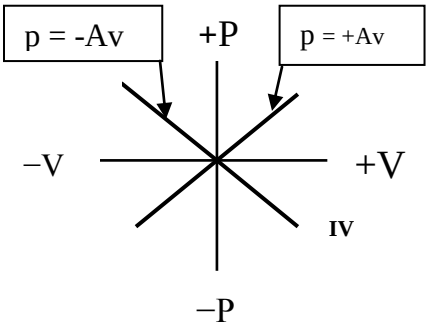


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Fig. 1. Equations of State for Tangent Gas [p = −Av]and Orthogonal Gas (p = + Av)

passing through the origin (i.e. when the intercept B is zero.).

Space solutions in one direction (say x) of Eqn. 4. are expressed as $u = f(ct - x) + F(ct + x)$ which represent two sets of waves traveling in the positive x-direction and the reverse.

Since solutions to the classical wave equation are linear, they obey the superposition principle.

3,7.1 To sum up: The linear tangent gas whose equation of state is $p = -Av + B$ is unique among gases, real or theoretical, in that its waves, of either rarefaction or compression and of any amplitude large or small, are stable and obey the classical wave equation (4) derived above.

The equation which is orthogonal to the tangent gas also exactly supports classical waves.

3.7.2 The wave speed c in the Tangent gas is positive: The wave speed c in a compressible fluid is given by

$$c^2 = dp/d\rho$$

and, since for the Tangent [$p = -Av + B$] we have:

$$dp = -A\, d\, \rho^{-1} = -A\,(-1)\ \rho^{-2}\ d\,\rho \text{ so}$$

$$dp/d\rho = +\ A/\rho^2 \text{ which is positive in .}$$

Therefore the interaction term 2cVfor the tangent gas is real and not complex.

3.7.3 The wave speed c in the Orthogonal Gas is Complex

As before, the wave speed c is given by,

$$c^2 = dp/d\rho$$

and, for the orthogonal equation of state $[p = +Av + B] = [+A\rho^{-1} + B]$,we have

$$dp = A\, d\, \rho^{-1} = A\,(-1)\,\rho^{-2}\, d\,\rho$$

$$dp/d\rho = -\,A/\rho^2 \text{ which is negative in sign , and so}$$

$$c^2 = = -\,A/\rho^2 \text{ and}$$

$$c = i\,[A/\rho^2]^{\frac{1}{2}}$$

so that in Quadrant I, the wave speed of the Orthogonal Gas is complex. The symbol i **is the imaginary number** or square root of minus one, $[-1]^{1/2}$.

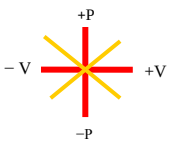
Physically this complexity means that the wave behavior is oscillatory or **resonant** at a particular point in space. This last result may have importance for the functioning of the human mind.

3.7.4 Waves of Compression in a Compressible Fluid or Thin Film: i.e. Acoustic or Sound Waves

The usual waves in compressible fluids and in thin films are acoustic or 'sound' waves. They are described by the classical wave equation, but are approximations to it. For example sound waves in air must be of low amplitude, otherwise any finite amplitude waves will at once grow to shockwaves.

The equation describing these stable acoustic small amplitude waves is the classical wave equation. The thermodynamics of air for example is described by the ideal gas law [pv = RT], but if sound waves in air are to be described by the classical wave equation then the restriction to infinitely low amplitude waves must be applied.

Acoustic or 'sound' waves occur in liquids and in solids as well. The acoustic wave speed or speed of sound c is considerably higher in liquids than in gases and is higher still in solids. In air this speed is about 334 m/s at sea level conditions. In water and watery body tissue it is 1540 m/s.



3.8. THE TANGENT GAS AND QUANTUM PHYSICS WAVE EQUATIONS

Quantum physics describes the world of the very small, namely that of the atom and elementary particles of matter at a space dimension of around 10^{-9} m.

Atoms and elementary particles are described, not as point particles of matter, but instead as wave packets having a finite dispersion in space. An atom for example is at once a particle and a wave.

The wave equations describing the nature and behavior of the atomic and sub-atomic world are derived from the classical wave equation as a base.

In quantum physics various wave/particle equations are then added to the classical wave equation to obtain probabilistic wave/particle equations, describing the probable location of the particle in space and its various quantized` energy levels. For example:

as shown above, the classical wave equation is (for one dimension x):

$$\partial^2 \Psi/\partial x^2 = 1/c^2 \ \partial^2 \Psi/\partial t^2.$$

The Klein-Gordon equation for a spin-less particle is:

$$1/c^2 \ \partial^2 \Psi/\partial t^2 = \partial^2 \Psi/\partial x^2 - (mc^2 /h^2) \Psi,$$

so that if the mass m is set to zero, the Klein-Gordon wave/particle equation reduces to the classical wave equation.

In a similar manner the other quantum wave/particle equations such as the Schrödinger equation are derived.

Our point here is that a basic starting wave equation for quantum physics is the classical wave equation which has the Tangent/orthogonal Gas as its only exact pv solution.

The wave interactions that go on in quantum physics lead to interaction energy terms 2cV in the quantum pulse energy equations. We have then used this quantum physics example of wave unity 2cV, emerging from an interaction duality to clarify and focus the argument in the Dualism debate in the Philosophy of Mind.

3.8.1 Wave/ pulse Interaction Energy 2cV

In the case of the classical wave equation, the wave pulses travel at

$$(dx/dt)_{I,\,I} = c + u$$

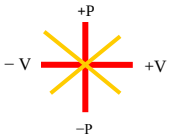
where u is the component of V in the x-direction.

Therefore the wave pulse energy in the x-direction is the square of the pulse velocity, that is

$$(dx/dt)^2_{\,I,\,II} = (\,c + u\,)^2 = c^2 + u^2 + 2cu$$

and 2cu is the interaction energy between wave and flow in the x direction.

In three dimensional flow, we then have for the flow energy : $(\,c + V)^2 = c^2 + V^2$ **+2cV,** or $(c - V)^2 = c^2 + V^2$ **−2cV.**



3.9 Thin Films of Living Tissue and Acoustic Type Classical Waves

Thin films and interfacial films have linear equations of state that are formally the same as those of the Tangent gas. In two space dimensions these thin films behave as a tangent gas would in three.

A possibility for biology then, is for the wave support entity we have described to also exist in any 'thin surface active film' of bodily tissue and fluid which obeys the appropriate linear equation of state for wave stability.

For a thin film to have such wave support qualities, it would need to have an equation of state analogous to $p = -Av$, but in two dimensions instead of three. Such thin films do exist [9,10,11]. For example, **certain condensed liquid films on either solids or liquids [11] have the equation of state**

$$\boldsymbol{\pi = -a\sigma + b}$$

where **π is a surface pressure and σ is an area;** a and b are constants pertaining to the line slope and intercept..

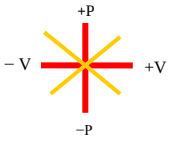
Comparing this with the Tangent Gas equation of state

$$p = -Av + B$$

we see that the two linear equations of state both relate to a **pressure** and **a space dimension function**, with the interfacial one referring to area while the Tangent gas equation refers to volume. Physically, however, with respect to wave behavior and entropy change , the interfacial film of a wave support entity in two dimensional motion should behave substantially the same as the tangent gas in three-dimensional (volume) motion, that is to say in flow and in expansion or contraction.

We may therefore reasonably speculate that biological thin liquid films may exist in the living cell membrane, and in the cytoplasm of the cell. Such 'thin films' should have the attributes of the tangent gas, namely support for the classical wave equation , wave variety, wave superposition, and wave stability, and wave-flow particle interaction.

Another thin film possibility is in the case of the **synaptic cleft** of the brain and nervous system. [12]. In this case, however, the films would be very thin indeed, as the clefts are only around 10^{-9} meters in diameter.



3.10 Conclusions

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The classical wave equation, which provides unique support for all types of stable waves, has been introduced.

The linear equation of state ($p = -Av + B$) describing a theoretical fluid obeying the classical wave equation, and known as the Tangent/Chaplygin/Tsien gas, is described.

The role of these fundamental wave equations in quantum physics is outlined.

In Part 2 we have applied wave/particle interactions to human Dualism by postulating that the human soul can exactly reproduce the classical wave equation behaviour in its interaction with the human body.

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Nomenclature

p	gas pressure
$v = i/\rho$	specific volume of a gas (volume of unit mass, inverse density)
pv	pressure volume energy (heat and work potentiality)
A,B	constants in equation of state of a gas
T	temperature
Ψ	wave amplitude
S	entropy
Q	heat
dQ, dT ,	heat and temperature change differentials
dS	entropy change differential
k	ratio of specific heats $k = c_p / c_{v,}$; (also called: adiabatic expansion exponent, e.g. pv^k = constant)
R	universal gas constant in ideal gas law
π	film pressure in thin film
σ	area of molecule in thin film
a,b	constants in equation of state

End of Webpage on Dualism

Back to Main Page

Excerpts and deletions

2.4.4 The Embodied Soul Described as a Force Field

In physical science, when dealing with various forces, gravitation, electromagnetic, and so on, we have **the useful concept of a field** , as specifying **the influence of some agency'** e.g. a force.

In the region into which we have ventured, between science and the Philosophy of Mind, we must go carefully , but perhaps we can also usefully express what we have laid out above regarding motion and force by saying that the energetic wave Ψ_s of a human soul, described mathematically or formally can also be usefully described as a 'spiritual force field'.

In this way, we can hopefully maintain progress towards a description of human Body/Soul duality in an ever more and more precise scientific terminology without inadvertently introducing any intrinsic materiality or quantification to the soul [3]..

So then, the soul's energy of wave motion can perhaps be conceived of as a **force field** encompassing the entire human body The specific energy associated with this wave force and its motion c is its square c^2, and its interaction with the physical motions in and of the body V is then a 'total' energy $E_{Total} = [c+V]^2 = c^2 + V^2 + 2cV$.

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3) In the case where the soul wave speed is complex [**ic**], the interaction energy is **2icV**. The physical meaning of the complex wave function is that it introduces a critical damping or spatial decay to the wave, so that the wave is spatially confined to a location. At that location a special wave behaviour can then take place, namely **wave resonance.** Complex wave speed arises automatically in the case where the equation of state is $p = + aV$.

(4) We may tentatively go on to envisage some of the soul's mental activity as a 'search' or 'scan' of stored data by the ' wave forms' and then a marking of, ---i..e. 'an insight into' – significant data points, order, patterns , forms, correlations, logical relations and the rest of intellectual life, by **wave resonances** in the complex wave field. In this view, the wave function scans the brain's memory and its data, while the complex wave interaction **resonates with and marks insightful, orderly, meaningful** data elements. While undoubtedly the soul's intellectual activities are far broader than this, still the postulate gives us a fresh start that appears interesting and useful.

Also, it is established that the neural signaling in the brain is electrochemical rather than electrical. Key features of this neural signaling are the rate of firing of the neurons, and that this rate may changes frequently. .

Draft Letters May 21/15

His Exxcellency,
His Excellency,
Apostilic Nuncie to Canada

Xx Manor Drive

Ottawa, ON xxxxxx

Your Excellency:

May I respectfully draw to your attention to a new Web Page (Print Copy enclosed) on the philosophical problem of Dualism in the Soul/body models of human nature.

The new Page is posted at two Websites which I maintain (www.shroudscience.info and www.energycompressibility.info) It, I think, overcomes the usual objections against classical Dualism raised, especially since the time of Descartes,to the effect that soul and body being dissimilar could not interact and form a unity. The Webpage offers a solution which is based on established wave and flow physics.

Theologians Rev.Karl Rahner S.J. and Rev. Bernard Lonergan S J. have in the past suggested that the soul and body cannot be completely dissimilar, otherwise unity would not be possible.

The new model proposes that this necessary similarity for real union could lie in an ability of the soul, when embodied, to engage in energetic flow and wave action following the laws of the physics of wave and flow. If this postulate is correct, then any relative motion between the embodied soul and the physical body at once produces a shared wave interaction energy (2cV)which is an intimate unity of soul wave speed c and bodily motion V, thus producing the "unity in duality" required by classical soul/body Philosophy.

This wave action postulate, if real, not only definitely refutes any dualistic objections to the classical theory of human nature being a soul or spirit in a physical body, but may also be open to possible scientific verification via certain characteristics of what is called in physics The Classical Wave Equation.

The simple fact of wave action in the embodied soul being a possibility ,it seems to me, at once refutes definitively the claim that unity in duality is theoretically or philosophically impossible. If the postulated wave action exists then the classical position is at once a 'unity in duality'. The wave action and unified energy flow term (2cV) postulated is standard wave and flow physics. Unless this postulate can be proved impossible, then the classical position once again becomes the clear solution of rational choice.

Of course, the soul body theory has always been the real theory of choice, since it alone accounts for the facts of unique human rational capabilities and the resulting unique human civilized achievements. The objection that dualism lacks unity is now refuted by the assigned wave action of the soul. This assigned wave action is standard physics, manifested in quantum physics

and in compressible fluid flow physics. Moreover, the assigned wave action being scientific, it becomes, in principle, open to scientific verification.

The wave action flow is offered as an attribute of the soul only when it is embodied; it is not assigned as an intrinsic physical attribute of the spiritual soul.

My hope is that the new approach may lead towards a restoration of that sense of " the feast of reason and the flow of soul" which is becoming obscured in human life outside of religion.
i
Yours respectfully,.

Bernard A. Power

P.S. For personal background, I am a consulting meteorologist (long retired) with special interests in flow and wave motion, compressible flow physics, and with applications to quantum physics, cosmology, atmospheric applications such as , tornado structure research, etc.

I have been a member of St. Veronica Parish, Dorval, Quebec for about 55 years, and will also write to His Grace. Bishop Thomas Dowd, Auxiliary Bishop of Montreal to keep him informed.

His Grace, Bishop Thomas Dowd,
Auxililary Bishop of Montreal,

Dear Bishop Dowd:

May I respectfully draw to your attention to a new Web Page (Copy enclosed) . The new Page is posted at two webwsites I maintain (www.shroudscience.info and www.energycompressibility.info) It, I think,

overcomes the usual objections against classical Dualism raised, especially since the time of Descartes,to the effect that soul and body being dissimilar could not interact and form a unity.

Theologians Rev.Karl Rahner S.J. and Rev. Bernard Lonergan S J. have in the past suggested that the soul and body cannot be completely dissimilar, otherwise unity would not be possible.

The new model offers a physical similarity solution which is based on established wave and flow physics. It proposes that this necessary similarity for union lies in the ability of the soul, when embodied, to engage in energetic flow and wave action following the laws of the physics of wave and flow. If this postulate is correct, then any relative motion between the embodied soul and the physical body at once produces a shared wave interaction energy (2cV)which is an intimate unity of soul wave speed c and bodily motion V, thus producing the "unity in duality" required by classical soul/body Philosophy.

This wave action postulate, if real, not only definitely refutes any dualistic objections to the classical theory of human nature being a soul or spirit in a physical body, but may also be open to possible scientific verification via certain characteristics of what is called in physics The Classical Wave Equation.

The simple fact of wave action in the embodied soul being a possibility ,it seems to me, at once refutes definitively the claim that unity in duality is theoretically or philosophically impossible. If the postulated wave action exists then the classical position is at once a 'unity in duality'. The wave action and unified energy flow term (2cV) postulated is standard wave and flow physics. Unless this postulate can be proved impossible, then the classical position oncc again becomes the clear solution of rational choice.

Of course, the soul body theory has always been the real theory of choice, since it alone accounts for the facts of unique human rational capabilities and the resulting unique achievements of human civilization. The objection that dualism lacks unity is now refuted by the assigned wave action of the soul. This assigned wave action is standard physics, manifested in quantum physics and in compressible fluid flow physics. Moreover, the assigned wave action being physical , the new model becomes, in principle, open to scientific verification.

The wave action flow is offered as an attribute of the soul only when it is embodied; it is not assigned as an intrinsic physical attribute of the spiritual soul.

My hope is that the new approach may lead towards a restoration of that sense of " the feast of reason and the flow of soul" which is becoming obscured in human life outside of religion.
i
Yours respectfully,.

Bernard A. Power

P.S. For personal background, I am a consulting meteorologist (long retired) with special interests in flow and wave motion, compressible flow physics, and with applications to quantum physics, cosmology, atmospheric applications such as , tornado structure research, etc.

I have been a member of St. Veronica Parish, Dorval for about 55 years and I very much enjoyed your recent parish visitation to us.

I will also be dropping a note about this Web posting to the Pastor, Fr. Kerouac and the Deacon, to keep them posted It is unlikely to surface locally and I imagine it will be of interest only to some philosophers of mind and possibly to neuroscientists.

I have written in similar vein to The Apostolic Nuncio, Msgr.

Rev. Frederic Kerouac,
Pastor,
St Veronica Parish,
Dorval, QC, H9S

Dear Father Fred:

May I draw your attention to a new Webpage I have posted on the web at two sites I maintain (www.shroudscience.info and www.energycompressibility.info) The new page is entitled:

Dualism and the Soul/ Body Problem: A New Proposed Solution—Wave Interaction Dualism

It deals with the old objection that the classic soul/body solution to human nature cannot be maintained because two dissimilar entities, soul and body, cannot form a unity.

Theologians Fr. Karl Rehner S.J. and Bernard Lonergan S.J have replied that soul and body cannot be completely unlike or they then could not be joined to form one human. But they did not suggest what this similarity between soul and body might be.

In looking into the question, I came up with a suggestion from quantum physics and compressible flow theory that seems to fill the need, namely that the soul might, when it is embodied, take on a wave action.. If this were so, then any bodily motion (V) would give a wave pulse (c) in the soul, and vice versa; the wave pulse would then always have an interaction energy (2cV) which would be a real " unity in duality"

I have written it up and will draw it to the attention of some philosophers of Mind and some neuroscientists. .

I doubt if it will surface locally, but if it does come up as a matter touching on religion, you will know what it is all about.

I have also written to Bishop Tom Dowd.

With best regards to you and to Gerry Turpin, who also may wish to have a look at the Web posting.

Sincerely yours,

Bernard A. Power

Professor Patrick Grim:
Professor of Philosophy of Mind,

Dear Professor Grim:

May I draw your attention to a new proposed solution to the problem of the dualism of Descartes dissimilar soul and body model.

It has been posted at two Websites I maintain and is entitled

Dualism and the Soul/ Body Problem: A New Proposed Solution—Wave Interaction Dualism

The site URL's are (www.shroudscience.info and www.energycompressibility.info).

The problem could, of course, possibly be solved if the proposed soul and body had something substantial in common, preferably something which could be verified.

I have considered a model where the soul when embodied possesses a wave action capability. And where any bodily motion V causes a wave actioin in the soul of wave speed c. and vice versa. In that case the wave pulses that are formed will have specific energy $c^2 + V^2 + 2cV$ where 2cV is the interaction energy. This combined energy would seem to constitute a real energetic "unity in duality".

The solution has analogies in quantum physics and in compressible fluid flow (gas dynamics), while the wave postulate shoul;d in principle be scientifically verifiable from the character of its waves in humans.

I have laid out the argument and the background science and references in the Webpage.

For personal background, I am a consulting meteorologist (long retired) with special interest in fluid flow, quantum physics, cosmological applications, tornado dynamics.

In working up the argument I was greatly assisted by your Great Courses lectures on the Philodophy of Mind. At my age I am long past the labor of journal publishing especial in interdisciplinary matters and so I use the Web as a manageable distribution for matrrial.I am intereted in if there are any results.

Descartes 'Dream Dualism' may be gone but his coordinate pv presentation for compressible flow waves and equations of state still remains indispensable to the understanding and analysis of the soul body problem !

With best regards.

Bernard A. Power

(Cut ftom Part 3 Referencrs)

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www.shroudscience.info