<u>HEAT</u>

In the physicist's attempt to develop theories which are an accurate description of nature, it is my opinion that, as a general rule of thumb, we should not be complacent but constantly strive to "perfect" the quality of our theories. Within the context of this paper, the meaning of this is as follows. When physics describes certain forms of energy, the explanations as to the nature of that energy are reasonably precise. For example, sound is described as a longitudinal wave propagating through a medium in the form of compressions and rarefactions. However, how precise is our explanation of heat? Can we say *exactly* what heat is? In my opinion, our explanation of heat is far from complete at this stage. However, it is possible to greatly increase our knowledge of the fundamental nature of heat so that we could develop a far more precise description. The initial part of this paper will strive to accomplish this.

This analysis of heat will not include radiation as that is reasonably well understood (long wavelength electromagnetic waves). Instead, conduction/convection will be analyzed. Let me outline a certain tenet which I advocate. When dealing with the propagation of energy, if the propagation is reasonably rapid, then the phenomenon is a wave. However, if the rate of propagation is reasonably "sedate", then the phenomenon is a particle. (The reader's immediate, and obvious, objection to this tenet pertains to light and the fact that light is comprised of photons. Firstly, light is also comprised of waves. Secondly, and more importantly, there will be a more intense analysis of the "structure" of light under the appropriate paper at this site.) Since conduction and convection are reasonably slow, then we can adopt the position that heat is comprised of particles. Consequently, to gain a more precise understanding of the nature of heat, it is only a question of developing a more in depth picture of the individual particles.

Any theoretical model of the nature of a heat particle, must explain certain known facts. The primary fact which must be explained would be "movement". As an example, any concentration of heat will not remain stationary but will instead propagate outwards to achieve a (fundamentally) uniform concentration. As an additional example, when a block of ice absorbs heat, the individual atoms will gain a certain amount of "movement"/mobility and move further apart to form a liquid. If the absorption of heat continues, the movement will continue and a gas will be established. Therefore, an integral element of the model for a heat particle would be as follows.

> *A particle of heat has an intrinsic state of motion via a conglomerate of sub-particles which are in constant motion. These sub-particles are bound together in order to comprise the composite particle.*

An approximate picture of a heat particle would be as follows.

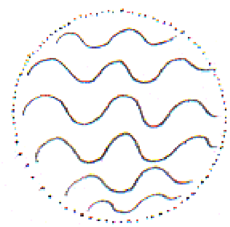

Fig.1

The reader may be wondering why wavy lines have been chosen to represent the particle. The following rationale may not be particularly scientific. Unfortunately, when attempting to unlock nature's secrets, our *initial* theorizing may not be based upon the most sound methods. (On television, I once heard Feynman addressing an audience and explaining the scientific method. He himself said that for the development of the initial theory, we guess.) When it is a hot day and we see heat emerging from a hot object, what we see seems to be in the form of wavy lines. It is for this reason that wavy lines have been chosen to represent the particle. However, these wavy lines are not the sub-particles previously referred to. On the contrary, these wave lines are comprised of sub-particles which are bound together and in constant motion. A pictorial representation of *one* of these lines is as follows.

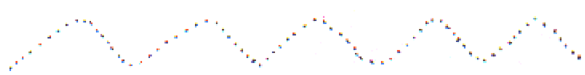

Fig.2

If the combination of these two pictures is fundamentally accurate, then a small advancement will have been made in our comprehension of nature. Unfortunately, as is all too often the case in science, progress has the potential to increase our ignorance. To be precise, the development of new knowledge may result in the development of new questions which need to be answered in regards to that new knowledge. One major question would be, what is the binding factor that keeps these sub-particles together? Furthermore, in regards to these wavy lines comprised of sub-particles, what binds the wavy lines to form a singular, composite heat particle? For the time being, I have no answers to these questions. They are questions which I will have to answer in the future. The reader should keep one critical thing in mind. Merely because I have no answers for the time being, that doesn't automatically render this theory wrong. *If* the theory is fundamentally correct, then it is simply a matter of developing answers for these questions in the future.

Einstein developed special relativity as a result of taking a basic phenomenon (specifically motion) "to an extreme". Namely, he wondered what would transpire if he were to ride a beam of light (in other words, something travelled at speeds close to that of light). If we were to take heat "to an extreme" would this yield any useful results? Specifically, if the level of heat were to be brought to a phenomenal level (within a designated area) would this yield new knowledge? The reader understandably feels that this is a foolish question. For decades physicists have been struggling to achieve inordinate heat levels for the attainment of fusion. Thus far, it has been unattainable as all known substances on earth vapourize above a certain temperature. Therefore, the idea of taking heat to an extreme within a designated area is a baseless question. However, let's work within the parameters of a Gedanken. Let's assume that new science/technology is developed which allows us to have an inordinate amount of heat without vapourizing the "apparatus" that is containing the heat. If the level of heat were to reach phenomenal levels, *without being absorbed by the walls of the apparatus*, what would transpire?

If my model of a heat particle is fundamentally correct, then certain precepts can be accepted. If the sub-particles are in constant motion, then there must be an incremental amount of room within the particle to allow this state of motion. In our Gedanken, we've already established that the heat will not be absorbed by the walls. In light of this, if the heat content is continuously increasing, then the only place for one heat particle to go would be within the incremental amount of room within another particle. An analogy to explain this "binding of two heat particles" would be with two atoms that form a covalent bond. However, this is only a superficial analogy since two heat particles would certainly not establish bonds the way atoms do. The *only* correlating factor would be that the two particles are "linked" together so that they propagate as a cohesive unit. This propagation (as a cohesive unit) would continue until the appropriate conditions prevailed to enable them to diffuse apart again. However, if these "bonded" particles could, in principle, exist, then certain "deleterious" effects would be induced. If the constant motion of these sub-particles is the "essence" of a heat particle, then their movement would be impeded thereby reducing the overall energy level of that *individual* heat particle. If this is accurate, then the reader may feel that the second half of this paper (taking heat to an extreme) is completely useless as it fails to produce any knowledge that is, even in principle, of a beneficial nature. However, this is not necessarily true. If two heat particles are in a bonded state, the energy of an *individual* particle within that pair may be slightly lower than a single unbonded particle. However, a bonded pair may induce a more useful energy yield than two unbonded particles. The rationale behind this is as follows. Let's assume that heat is being utilized to drive a piston. When one particle hits, there will be some very brief interval before another particle hits. The use of energy would be far more efficient if this time delay could be avoided. However, if two bonded particles hit, even though each particle has slightly less energy than a single unbonded particle, this would be a far more efficient utilization of energy since this time delay is completely prevented.

To expound upon this a bit more, let's say that an individual bonded particle possesses 75% of the energy of a single unbonded particle. A pair of bonded particles will obviously possess 150% of the energy of an unbonded particle. Even though two unbonded particles will yield 50% more energy than a bonded pair, there will, as has already been stated, be a time interval before the second particle hits thereby causing an incremental dissipation of energy in that brief time interval. If all of the heat particles could exist in this bonded state, then that means that the energy yield would be slightly greater than heat particles propagating independently as a result of the slight time delay being avoided.

Therefore, assuming that the tenets outlined in this paper are fundamentally accurate, then the principles are useful.  Industry would become far more efficient and cost effective if our energy yields could be rendered more efficient.  However, the central question is, how could we possibly attain these bonded states given the difficult preconditions necessary for their attainment?  This would be the domain of future theorizing and research.