The Concept of Fluid Space Holds Promise to Resolve Many Issues of Modern Cosmology

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October 26, 2004

According to the latest theories, we live in a universe permeated by a strange form of dark energy that is accelerating its expansion, flinging galaxies away from us at increasing velocities. We are also told of unobserved dark matter that is responsible for holding the stars within these same galaxies together. In fact, there are enough new and exotic theories being proposed that followers of astrophysics are left wondering what to believe, and where to place their skepticism. All this to explain recent observations that don't fit the standard model. My engineering experience has taught me to realize when I am out on a limb explaining data. It is then that I have to conclude that I have either missed something basic, or that I am looking for something that does not exist. The world of physics is currently out on a very long limb.

Perhaps there is no theory that can reasonably explain observations in terms of known particles and forces. Perhaps there can be no full understanding of the universe, or perhaps something basic has been overlooked. It is in terms of the latter alternative, that the Fluid Space theory is offered. Throughout history, physicists have struggled with the question of space. Does it have a physical reality unto itself or does it represent nothing at all. Albert Einstein's Theory of General Relativity has advanced physical theory to new heights and is now the widely held concept of the universe, yet falls short of explaining recent observations. Something basic has been overlooked, so let us briefly review some basics.

Relativity was much more than a refinement of earlier theories, yet without the existence of Newtonian theory, the subtle evidence of the correctness of Einstein's theory of relativity would have gone undetected. The theory of relativity was seen as a revolution in scientific thinking, and as such, the table of thought had to be cleared and reset. The effort to distinguish the differences with what went before may have gone too far. Many concepts basic to Newtonian physics were discarded, including the concept of absolute space and with it went the concept of motion or acceleration of a body relative to space itself. Einstein made pronouncements that there is no need for the concept of absolute space, only the relative motions of field need be considered, and that "there is no space without field". Space was thus striped of any corporal realness and in so doing he may have denied himself access to his ultimate goal of a unified theory. The concept of space, as a flowing four dimensional fluid, may resolve seeming conflicts with earlier constructions and call into question the correctness and necessity of such pronouncements.

Heisenberg had this to say *"The existence of centrifugal forces in a rotating system proves - so far as the theory of relativity of 1905 and 1906 is concerned - the existence of physical properties of space which permit the distinction between a rotating and nonrotating system. This may not seem satisfactory from a philosophical point of view, from which one would prefer to attach physical properties only to physical entities like material bodies or fields and not to empty space. But so far as the theory of electromagnetic processes or mechanical motions is concerned, this existence of physical properties of empty space is simply a description of facts that cannot be disputed."*

Newton's strongest argument for the physical reality of space was that of rotational motion.

This argument is still quite compelling today. An object experiencing weightlessness is said to represent an inertial reference system. Imagine a spoke and wheel space station alone in the void. This station represents an inertial frame of reference and the inhabitants float weightless within it. Now imagine an identical space station parallel to the first, without any physical connection, but aligned at the hub so that they share a common axis. The second station has rotational motion relative to the first. The inhabitants of this station experience the sensation of gravity and are able to walk about. If they descend outward, gravity increases, and if they climb to the hub, only then can they experience weightlessness. They are amazed when they look out the window and see the inhabitants of the other station floating weightless in all locations.

An endless string of these space stations may be imagined, all with different rates of rotation; but on only one will weightlessness exist throughout. What gives such special status to the inertial reference system? If rotational motion relative to space alone may be detected by the observation of accelerations in the extremities of a body, then space must have some inherent physical properties of its own. If an object may rotate relative to space then it may also travel through space and accelerate through space. This leads to the dilemma of gravity. How to explain the equivalence of linear acceleration of a mass in space and the weight of an object at rest on a gravitating body? If being a rest on the surface of the Earth is equivalent to being accelerated through space, then conversely, space may be imagined to be accelerating through the surface of the Earth. The Earth, being a sphere, would require this to be going on from all directions, a seeming impossibility. Why then the equivalence of inertial and gravitational mass?

Einstein's solution to this dilemma was dismissing the concept of space altogether. The motions of material points were determined by the accumulated overlapping fields of all other material points in the universe. It is easy to see how immersion in the field of other bodies enables an inertial system to orient itself in a rotational sense with the rest of the universe. How this brings into existence radial accelerations in a rotating body, that would not otherwise be present, is unclear. It is in essence an "action at a distance" argument. In addition, the notion of space has never been totally eliminated, and keeps creeping back in discussions of curved space and expanding space. Cosmological theories dealing with the apparent expansion of the universe, harbor the concept of absolute space, with regions of space in motion relative to other regions of space. With fluid space, the dilemma may be resolved without the need to dispense with the concept of physical space.

The answer lies in accepting space itself as real, and the solution to what at first appears to be a whimsical problem in relativity; the funnel. A fluid is in steady state flow down a long slightly tapering funnel. This fluid may be considered to be very light as to have virtually no mass, it is also without viscosity. As the fluid flows down the funnel it is squeezed and must accelerate to greater velocity as it progresses toward the narrow end. The funnel continues to an extremely fine point. As the end of the funnel is approached, the velocity of the fluid approaches the speed of light and both spatial contraction and time dilation become significant. At some point prior to the exit of the funnel the flow velocity reaches the speed of light. At this velocity the unit length of the fluid, in the direction of flow, is reduced to zero and thus the volume of the flow goes to zero as well. The unit length of time passing in the fluid becomes infinite, as does the fluid density, and nothing ever comes out the end of the funnel! See figure 1.

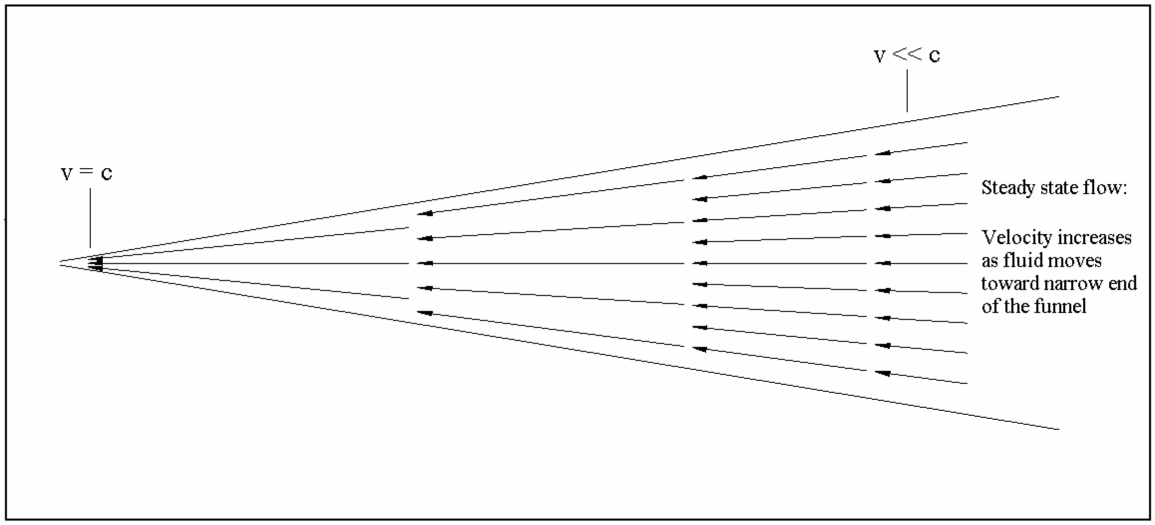


Figure 1.

The velocity and acceleration of the flow field are determined by the funnel geometry and the change in fluid volume with velocity. In the case of steady state flow, the velocity and acceleration of the fluid at any fixed point within the funnel are constant. Therefore, an object suspended in the flow will have both constant velocity and constant acceleration relative to the fluid. On this basis, the flow field may be probed and charted using a very small clock, of known mass, attached to a fine, yet strong, string. The clock is dangled into the funnel to determine the properties of the flow. By measuring the force exerted on the string, the flow acceleration may be determined. From the rate the clock runs, the flow velocity may be determined, by applying the transforms of special relativity. See figure 2.

The imaginary fluid inside the funnel is space itself. This is a difficult concept and it must be made clear that this flow field is not to be imagined as a fluid flowing against a background coordinate system; it is the background coordinate system of the universe itself, if you will, that is undergoing a constant, steady, fluid distortion.

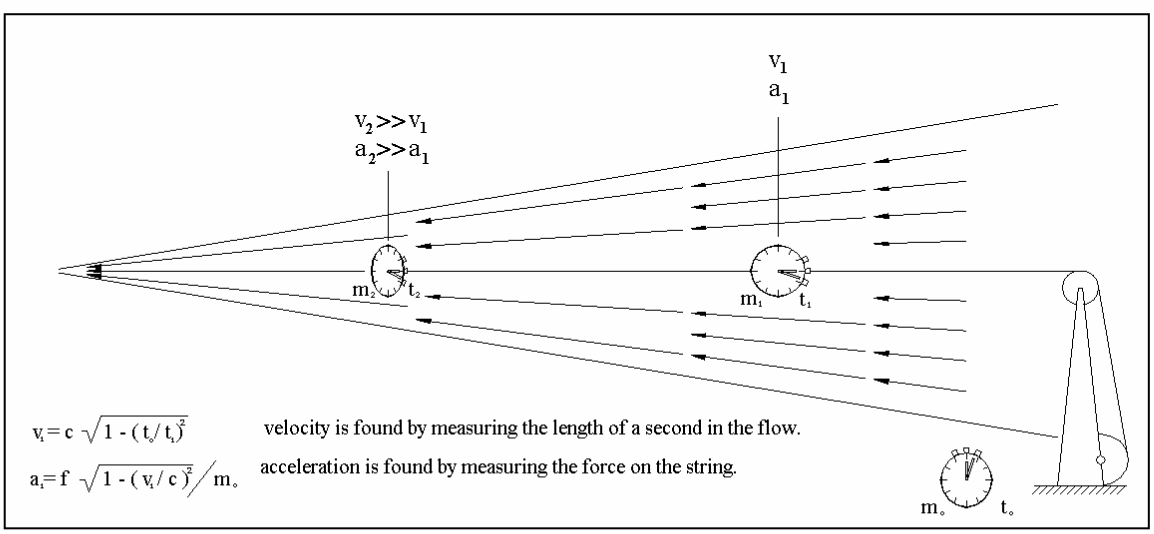
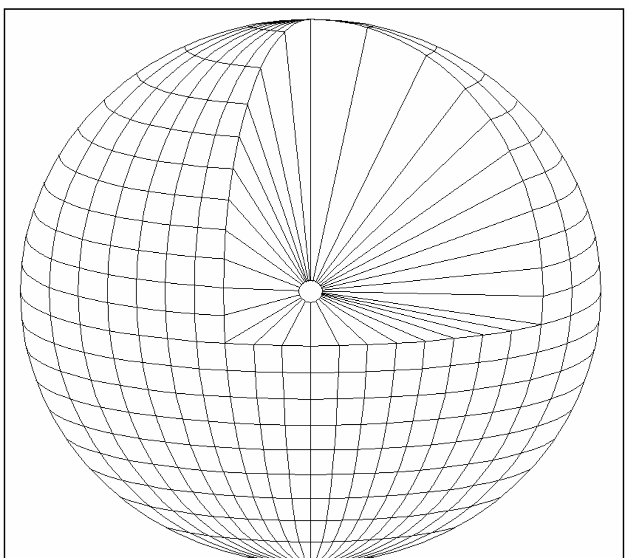


Figure 2.

The probing of this hypothetical flow field yields some striking similarities with the spatial fields of general relativity. The first observation is that the deeper into the funnel the clock is lowered, the greater its apparent weight. The flow field is a gravitational field. The next observation is that as the clock is lowered, it begins to run more slowly. Time dilation exists in the flow field. Another observation is that a length of string greater than the length of the exterior of the funnel may be reeled out while the clock remains in the flow field. The space inside the funnel is curved.

So what does this imaginary funnel flow have to do with anything in actual experience? Consider that a great number of identical funnels may be arranged around a common vertex. The result is a sphere of funnels, and any gaps between neighboring funnels are also of funnel shape. See figure 3a. If equal flow fields exist inside all the funnels in this sphere, then there is no need for the funnel walls and a spherical flow field may be imagined. See figure 3b. In this way, a complete replication of a gravitational field, as defined by general relativity, may be constructed on the basis of spatial flow.

So why conceive of fluid space? If the concept of fluid space leads to a result that is already understood and described in perhaps a superior way by general relativity, what is the use? If fluid space offers nothing else, it has at very least the potential to bring understanding of the concepts of general relativity within the grasp of a greater number of people. Further consideration of fluid space, however, yields a wealth of implications; from the nature of matter, to the fate of the universe.



A large number of funnels may be arranged to form a shpere.

Figure 3a.

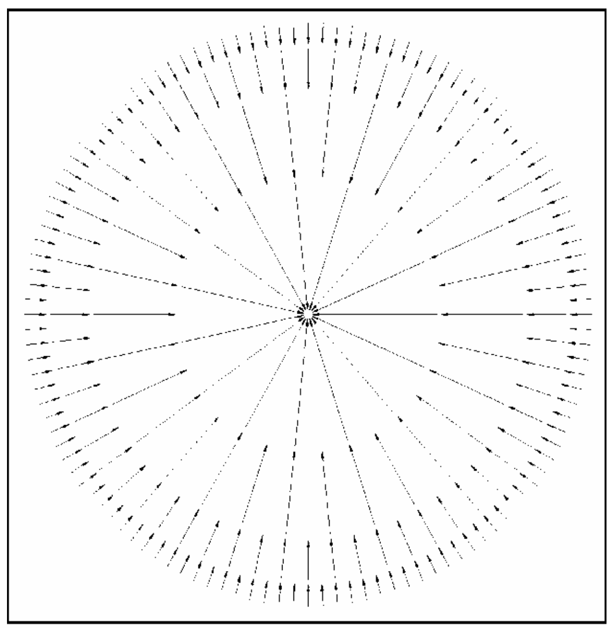


Figure 3b.

At the center of the flow field there is a tiny sphere that is bounded by the surface where the flow velocity reaches the speed of light. This is similar to the Schwarzschild radius predicted by general relativity, yet within the context of fluid space the interpretation of this surface is somewhat different. This surface represents the boundary where the flow of space-time comes to a stop and as such the region contained within the surface is not space-time but something altogether different and apart from our universe. It represents a discontinuity of space-time when viewed from the outer regions of the flow field. When seen in this way, the flow of fluid space-time can describe a particle. It is also a particle of finite size, not a mass point. This particle can be viewed from two basic perspectives, from the inner boundary or from the outer regions

When viewed from the outside, it would appear nearly perfectly spherical with a well defined boundary or surface. When viewed from the inside, geometry would be quite different from our experience. At the heart of the gradient, space is compressed in the radial direction, so once inside it would seem like a long narrow tube. Near the tiny discontinuity at the center, the radial dimension would become infinite compared to the circumferential dimensions, yielding in essence, a one dimensional object. Vast distances in the radial direction on the inside would appear as slight fluctuations in radius observed from the outside. What would appear as a tranquil surface on the outside could become a raging tempest when viewed on the inside. The inner flow surface boundary could become quite elongated, vibrate, undulate or twist dramatically perhaps with small droplets being cast off and later rejoined.

One of the most compelling aspects of the fluid space theory is that it has general relativity and quantum behavior built into it. The general relativity aspects of the theory predict that every inflow field will include gravitation and have a surface at some minimum radius. The size of the minimum radius depends on the amount of energy in the flow field. Inside this surface, will be a discontinuity of space-time. The position of this surface will however depend on the relative velocity of the outside observer giving it an amount of uncertainty. Considering that the surface must also have wave like properties, there would be a minimum size at which the circumference will equal one wave length. This then requires that the size of stable discontinuities come in quanta, or multiples, of the minimum size allowed by integer wavelengths.

The discontinuities could come in various diameters and even in rings or loops. When two of these inflow particles interact at long range, they exchange a portion of their flow fields. This is similar to the virtual photon exchange concept of quantum theory. When two inflow particles interact at close range, a much larger amount of flow field is exchanged. When the amount of flow field being exchanged is large enough, it will give rise to a spatial discontinuity similar to the inflow fields themselves, this one will, however, be unstable and depend on the two or more stable flow fields nearby to create circumstances that allow its existence. This is similar to the virtual particle exchange concept of quantum theory.

There are several implications for cosmology as well. A fascinating feature of the fluid flow field is that the flow direction may be either inward or outward. Regardless of the flow direction, the acceleration is always inward, creating attractive gravity. The existence of the flow, inward or outward will however produce a cosmological effect, expanding or contracting the space around matter over time. Thus fluid space theory also has a built in basis for cosmological terms without the need for their addition by any other assumptions.

Fluid space theory predicts that there could be two kinds of matter, that with a spatial inflow (normal matter for us) and that with a spatial outflow (antimatter). This would lead to regions of the universe dominated by a single type of matter to be either expanding or contracting. If intergalactic space is determined to be expanding, it may indicate the presence of antimatter. The fluid space concept also predicts regions with visible and dark matter to be contracting. The ratio of amounts of these two types of matter in the universe will determine the overall curvature of the universe.

Red shifts in distant galaxies need not be entirely due to velocity differences. In fact, recession velocities could be largely an illusion caused by the expanding space between galaxies stretching light waves while the contraction of space around galaxies holds the galaxies together. On its trip between galaxies, a light wave will spend a far greater amount of time in expanding space than in contracting space, leading to a larger red shift with greater distance, without the need for any real velocity difference between the source and the destination. See figure 4. The fact that the observed Hubble constant predicts an age for the universe lower than the age estimated for some types of stars could be seen as evidence for the contraction of space around matter that leads to an over all expansion of the universe slower than the Hubble constant predicts.

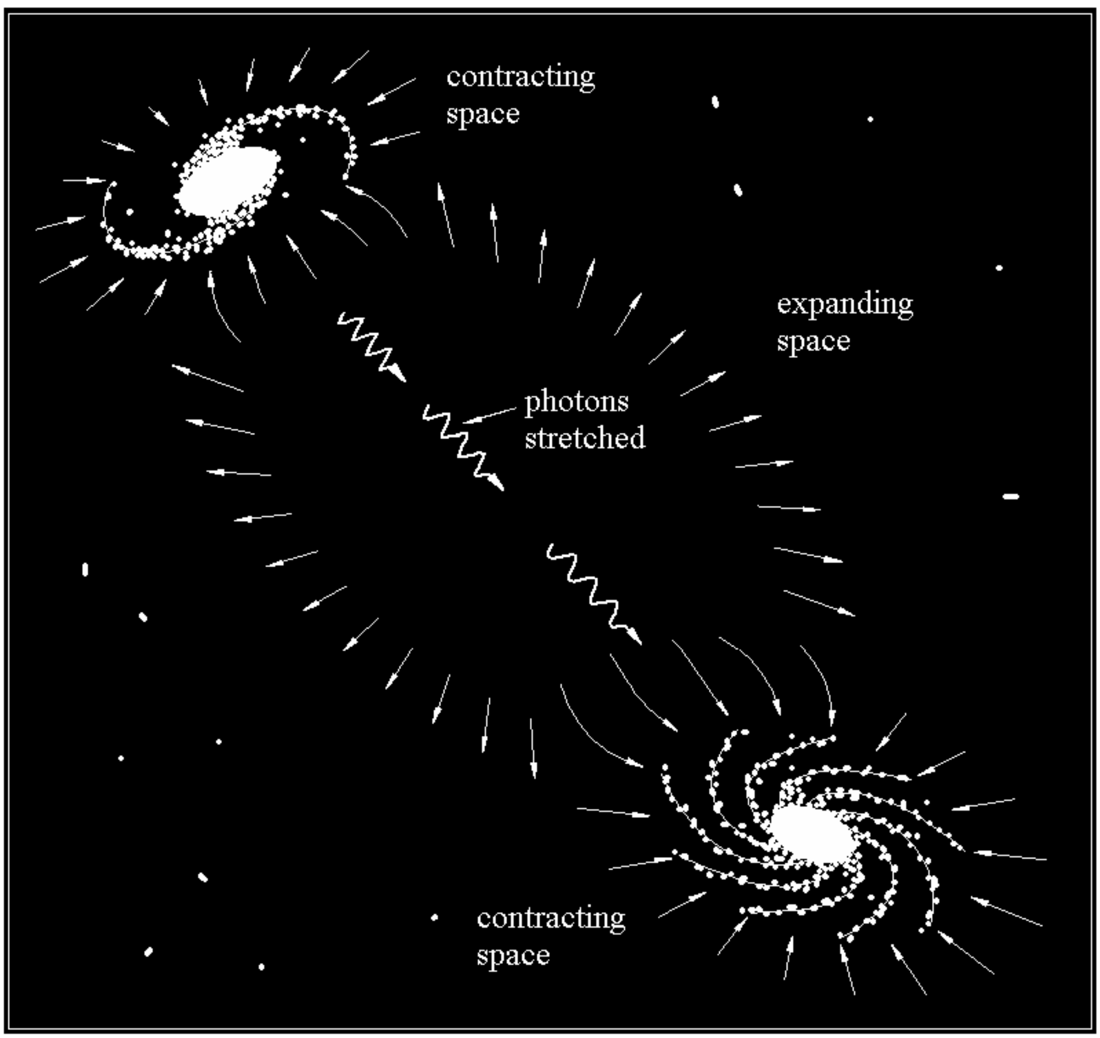


Figure 4.

The piece of the picture that is missing from general relativity, the basic thing that has been overlooked, is the contraction of space around matter. Rotation rates of galaxies and galactic clusters indicate that they should be flying apart which has lead to the search for the "missing matter". Perhaps there is no need for any additional matter, the galaxies may be flying apart, but only enough to keep up with the contraction of space that, in this case, works together with gravity. Once again here is evidence for the contraction of space around matter.

Variations in the CMB could result from regions of contracting and expanding space in the early universe. If such regions were originally of equal size, the overall space of the universe would be flat. The result is a sort of boiling cauldron effect, where space generated between galaxies is consumed by the galaxies. Depending on the relative amounts of expanding and contracting spatial regions, the universe may be steady state or destined to expand forever or contract back in upon itself. The relative amounts of each type of matter might be estimated by mapping variations in the CMB.

So what does this have to do with ordinary life? In order to control a thing, its existence must first be known. It may not be possible to control the flow of fluid space-time, but if it is, some truly amazing things might be done. The first implication would be the construction of gravitational devices. If gravity could be artificially produced or controlled, access to the solar system and the stars would be greatly improved. Ordinary life would not be so ordinary any more.

Such notions may be only idle speculation, however, a century ago computers and high definition television would have been inconceivable applications of the new frontier of electromagnetism. For now, the concept of fluid space offers an explanation of many phenomena without the need for strange, new, undiscovered forms of matter and energy. Fluid Space reveals instead a new property of the matter we already know. The destination of this path of reasoning may be something we cannot at present imagine.