**Can fluid dynamics describe the behavior of vacuum space?**

Arieh Sher

**Abstract**

Yes, I claim that the ether that fills the vacuum space is a type of fluid that permeates everywhere in the vacuum space. Therefore, fluid dynamics can be used to describe the entire structure of the universe according to general relativity and quantum physics for describing subatomic particles.

**General**

In paper **[1]** I explain, using general relativity, how the fact that the ether (or– the vacuum space) exists, can explain observations such as stellar aberration and the Michelson- Morley experiment. General relativity claims that space is dragged by any celestial spinning body. Space dragging was verified by an experiment Gravity probe B. This experiment was done near Earth so the measured values of frame dragging are minuscule. However, general relativity predicts that around massive bodies such as a neutron star or a black hole, the frame-dragging is significant. A reasonable conclusion is that to be dragged the ether cannot be a void but must have a physical property - a viscous behavior. The hypothesis that general relativity and fluid dynamics can be identical was suggested by T. Padmanabhan **[2].**

In paper **[1]** I claim that the matter universe has a structure that contains a central spinning neutron star (designated the Pivot) and a visible universe that orbits the Pivot. This structure of the matter universe using general relativity can explain many known cosmological observations. For example, the velocity flattening and the spiral shape of galaxies, the flatness of the visible universe, etc. For more details see **[7]**

**Fluid dynamics**

The Navier-Stokes equations that describe the behavior of any type of fluid are given by the following equations. The first equation is the mass conservation and the second is based on Newton's law F=m x a

$$\nabla \cdot \underline{u} = 0$$

$$\rho \frac{D\underline{u}}{Dt} = -\nabla p + \mu \nabla^2 \underline{u} + \rho \underline{F}$$

Where: u=velocity, ρ=density, p=pressure, μ=viscosity, F=forces.

The Navier-Stokes equations cover a wide range of fluid behavior. This range can be divided into regimes. The regimes are defined mathematically by the Reynolds number which is a dimensionless number.

Stokes defined it as $Re = \frac{\text{inertia forces}}{\text{viscous forces}}$. Reynolds defined this number as $Re = \frac{\rho v d}{\mu}$

This number is used to categorize the fluid system. A low Reynolds number is defined as a laminar flow described by Stokes flow. It describes the situation on an astronomical scale. Whereas a high Reynolds number describes turbulent flow that is suitable for atomic scale.

Dominik Beck describes a slow-rotating sphere in a viscous fluid. A schematic flow pattern around the sphere is given in the following figure 1. The similarity to the flow pattern of the ether around the Pivot, derived from general relativity, is shown in Fig. 2. In both figures the dragged space is a flat disk at the equatorial plane and spirals at both poles.

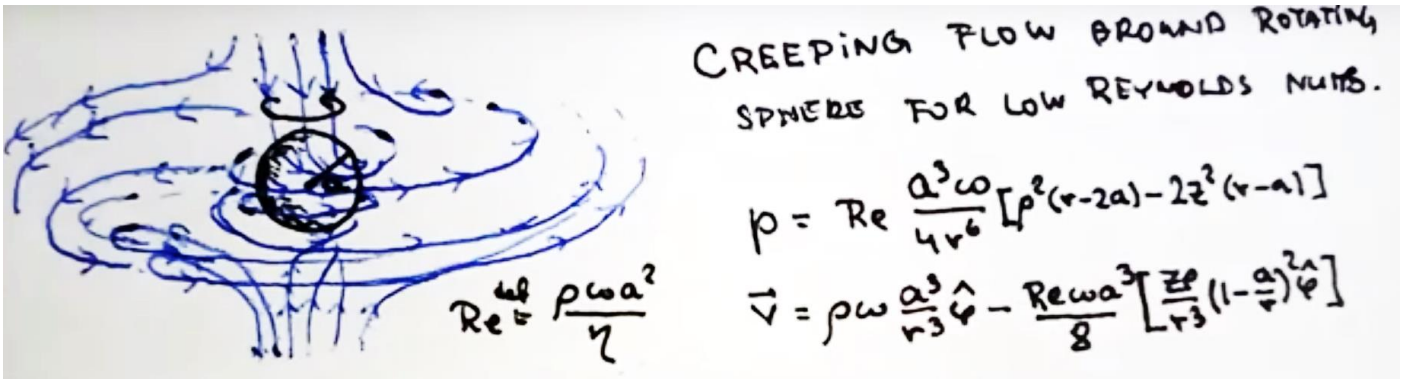


Fig. 1- Fluid dynamics-creeping flow around rotating sphere for low Reynolds number. **[3]**

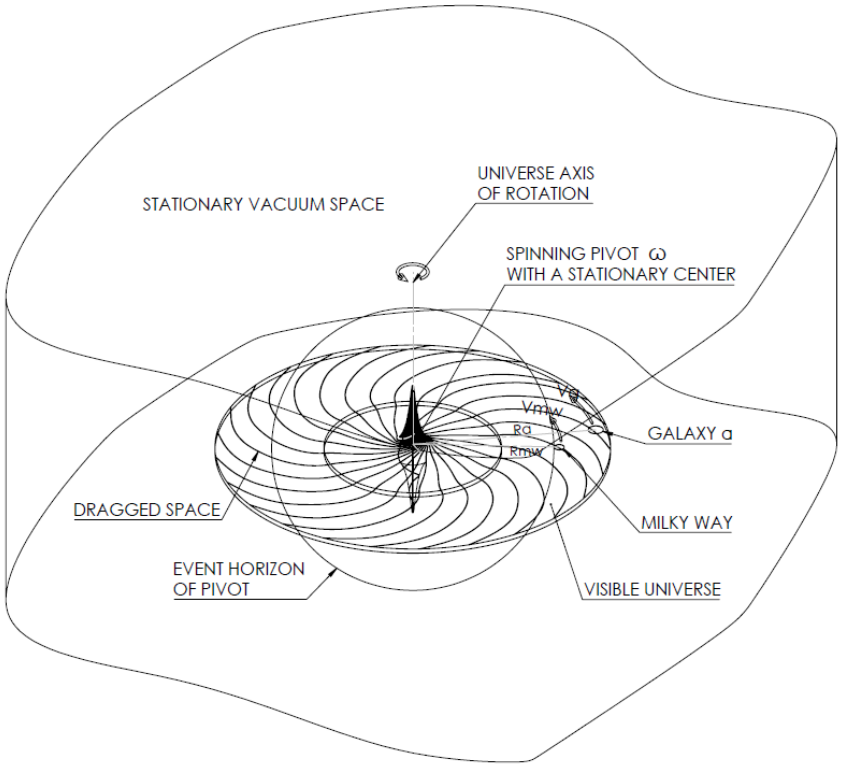


Fig. 2 – The Pivot universe according to general relativity. **[1**

**Subatomic regime**

A recent idea described by David Tong is the connection between turbulent flow and the chaotic behavior of quarks. **[4]**

The left figure is the description of quantum fluctuating in vacuum space and the right is turbulent in a fluid. 3D visualization of quantum fluctuations is given in **[5]**. The volume of the box is 2.4 by 2.4 by 3.6 fm, big enough to hold a couple of protons.

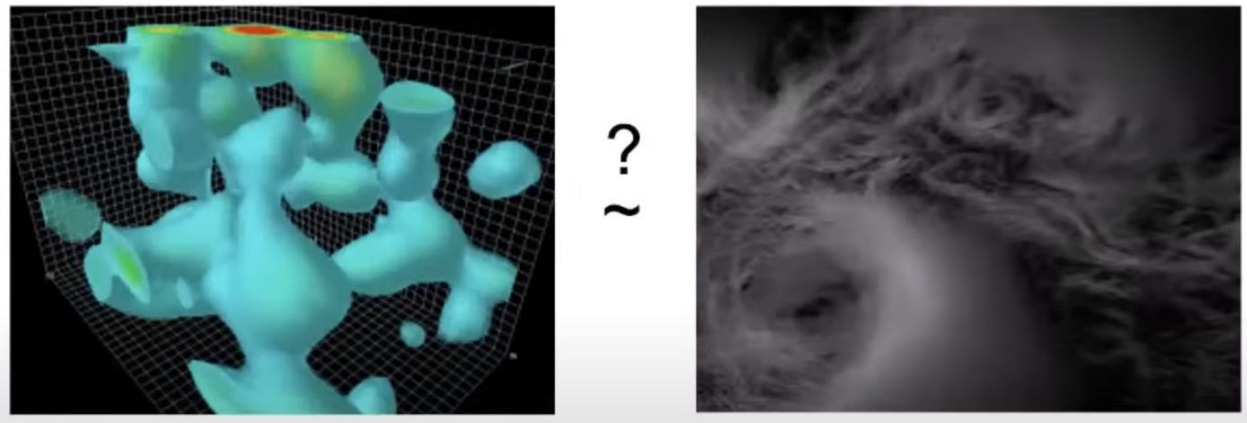


Fig. 3 – Resemblance of quarks (left side) and turbulence (right side)

**Celestial bodies spinning**

It is observed that all celestial bodies spin in the same direction. What is the reason for that? Fluid dynamics can explain this. The reader is referred to an experiment of Stokes flow that is shown in NSF (start time: 3:38 min) **[6].** Relating to the Pivot universe, the origin of the celestial body's spin can be explained. Bodies orbiting the Pivot are dragged by the viscous space and simultaneously spin around their axis in the opposite direction to the Pivot spin.

**Summary**

The goal of this paper is to explain qualitatively how the entire universe can be described by fluid dynamics. It shows the similarity between the general relativity solution and fluid dynamics. In both cases, the system is described by a rotating sphere that drags a viscous fluid around it. It can also explain the chaotic (or turbulent flow) in the atomic scale.

A quantitive solution is needed for fluid dynamics. One has to define viscosity, density, pressure, and gravity forces. The solution for general relativity is simpler as shown in **[1].**

**References**

[1] Arieh Sher**,** Does Newton's ether exist?

[2] Franck Delplace, Liquid spacetime (Aether) viscosity

[3] Dominik Beck Fluid dynamics | Creeping flow around rotating sphere for low Reynold number

[4] David Tong On Quarks and Turbulence by David Tong - YouTube

[5] Dereck Leinweber Quantum Fluctuations - Quantum fluctuation - Wikipedia

[6] G.I. Taylor NSF "Low Reynolds number flow" https://www.youtube.com/watch?v=QcBpDVzBPMk

[7] Arieh Sher The structure of the Pivot Universe