Presentation of Hydrostatic Equilibriums

A Presentation Given to You by Andrew Nassif
Hydrostatic Equilibrium is a condition in which volume of the fluids are staying at rest or reaching a constant velocity. This term is very important in Physics, especially in fluid mechanics.
Mathematical Analysis

\[ F_{\text{top}} = -P_{\text{top}} \cdot A. \]
Variable 1: Force of top
Variable 2: Pressure
Variable 3: A represents a number

\[ F_{\text{bottom}} = P_{\text{bottom}} \cdot A. \]
Similarly you can find the opposite equation of one pushing upwards rather then downwards.
Application

Astrophysics

• In astrophysics, when you are given a star's layer, you can use hydrostatic equilibrium to find out the thermal pressure from below the weight of a material pushing upward.

• Hydrostatic Equilibrium is also important in measuring the core of clusters in a galaxy.

Planetary Geology

• This process is important in determining what type of planetary objects are out there, as well as the dynamic layers of planets and celestial objects.

• Hydrostatics can also determine the shape of a planet with thermodynamics as a measurement of fluid flow in a terrestrial planet or object.
**Fluid Statics**

- Fluid statics is the same thing as hydrostatics and it means fluids at rest.
- The use of fluid to do work or in mechanical engineering is called hydraulics.
- Hydraulics is part of a scientific series known as Continuum Mechanics.
Table of Hydrostatic Machinery from 1728 Cyclopedia
Measure of Hydrostatic Pressure

\[ p(z) = \frac{1}{A} \int_{z_0}^{z} dz' \int_0^A dx' dy' \rho(z')g(z') = \int_{z_0}^{z} dz' \rho(z')g(z') \]

1. \( P \) is the hydrostatic pressure
2. \( \cdot \) is the fluid density (kg/m\(^3\)),
3. \( g \) is gravitational acceleration
4. \( A \) is the test area
5. \( z \) is the height parallel to the direction
6. \( z_0 \) is the height of the zero reference point of pressure
Sources
