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Beyond Newton and Archimedes

10 chapter pages 340

Think ahead of Newton, Archimedes and Einstein

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Central Idea

1 Newton's Second law of Motion

Newton did not discover the Second Law of Motion F=ma. It is clear from the critical study of the Principia, Book I (8 May 1686) page 19-20. Nobody knows who has given F=ma?

Thus the school level textbooks of 220 countries need to be re-structured as coming generations have right to know the truth. Gods have not given us right to impose false ideas on young brains.
The equation F =ma reduces to first law of motion when a=0, F=0
What is value of mass m?

m =F/a = 0/0 (undefined)

Can there be bigger limitation than this? We need to improve equation logically. Newton has not given F=ma, so limitation is of the others.

2 Newton's First Law of Motion

The background of Newton's laws of motion is discussed since days of Aristotle (384-322BC), Philiponnus (490-570), Buridan (1300-1358) and Galileo (1564-1642). Newton's First Law of Motion is nothing but Galileo's Law of Inertia. The First Law of Motion (2nd part) is applicable under ideal conditions when resistive forces (frictional forces, atmospheric forces, other forces etc.) are not present in the system of body and medium. Only then a stone once thrown on road will move eternally with uniform on the road. The Second Law of Motion is just mathematical form of Newton's first law of motion. Now F=ma is meant for ideal system and results are also for practical system. It would be prudent to formulate an equation for practical system then draw conclusions for ideal system. In this case force would not be dependent on acceleration.

3 Newton's Third Law of Motion.

Consider a boy is standing at distance of 10m from the wall. Boy holds a rubber ball and cloth ball in hands.
(i) Firstly boy throws rubber ball with force 2N on the wall. The rubber ball after striking the wall rebounds to 10m. Thus action and reaction are equal in this case.
(ii) Secondly boy throws cloth ball with force 2N on the wall. The cloth ball rebounds to 5m (FIVE metres). Thus action and reaction are not equal. Thus " to every action there is opposite reaction but it may or may not be equal to action."

4 Generalized Archimedes principle

Archimedes stated principle : 250BC
Newton's Law of Gravitation and g was stated in 1685, after 1935 years of Archimedes principle.
How Archimedes principle was justified for 1935 years without eqautions?

2265 years old Archimedes principle predicts that when body floats then density of body must be equal to that of medium or $D_b = D_m$.
Other factors are insignificant. Archimedes principle has limitations (in case completely submerged balloon) that it does not take in account the

(i) shape of body
(ii) and viscosity of medium under consideration. Why it not mentioned in textbooks?
In addition Archimedes principle has one more serious limitation. Also under feasible conditions, the principle *predicts* that the volume of medium filled in

floating balloon/vessel becomes indeterminate i.e.
V (volume of medium filled in balloon) = 0/0.
These are serious limitations of the principle. Archimedes principle is generalized

up thrust 'PROPORTIONAL TO' weight of fluid displaced

$$U = f\, VD_m g$$

where f is coefficient of proportionality. The generalized form (though f takes) takes all elusive factors in account.

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5 Water Barometer
Or New Method To Measure g

Evangelista Torricelli (1608-1647) constructed mercury barometer in 1644.
Height of mercury column = $P/D_w g$ = 0.76 cm of Hg
P , atmospheric pressure = $1.013 \times 10^5\ Nm^{-2}$
Dw =1000 Kg/m^3
g = 9.8m/s^2

Even after 370 years Water Barometer has not been constructed. The height of water column must be 10.337m

6 Importance
Measurement of mass of Earth by Water Barometer

The water barometer offers a new method for measurement of g. g is used in measurement of mass of planets and distances between them. So slight varaition of g will affect astronomical data . This is importance of the experiment.
Now mass of the earth is given by

$$M = gR^2/G$$

g = 9.8m/s^2
R = 6400 km
G = G=$6.67545 \times 10^{-11} m^3 kg^{-1} s^{-2}$
If height of water column is different than 10.337m: then value of g will be different from g = 9.8m/s^2

, hence mass of the earth will vary. It will change the other astronomical date. It is importance of experiment.
If the height of water column is found different from 10.337m , then value of g will be different.

But even after 370 years the Water Barometer has not been constructed. In case the height of water column is not 10.337 m, it may affect g. It means values of masses of astronomical objects and distances will vary. This is importance of the experiment. Further heights of liquid columns can be calculated for ethyl alcohol, glycerin for completeness.

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7. 2360 Years Old Aristotle's Assertion when Stokes law is valid

According to Aristotle's assertion of falling bodies,

'heavier body falls down quickly'.

It got immediate support from the fact that a stone falls quickly than a straw. Mathematically,

falling tendency 'PROPORTIONAL TO' mass of body.

It was contradicted by Galileo [1564-1642] after 2000 years of use . Galileo demonstrated that all bodies fall with same acceleration i.e. travel equal distances in equal intervals of time. It got immediate support from the fact that a ten pond shot and one pond shot fall at same time in air. Thus

'all bodies fall equal distances from equal intervals of time.'

Stokes law is valid in fluids in narrow range of parameters. Mathematically falling tendency (average velocity) 'PROPORTIONAL TO' mass of body. Thus mathematical equations for Aristotle's assertion and Stokes law are the same, hence abundoned Aristotle's assertion is true as long as Stokes' law holds good.

8 No theory on rising, falling and floating bodies exists in science.

Existing theories are qualitative or incomplete

All the existing theories (Aristotle's Assertion, Archimedes principle, Law of Gravitation, Stokes law , Drag force, Currsin and Lumbley 's equations) on rising, falling and floating bodies are discussed. None of the theories explain the phenomena quantitatively. Consider following demonstration (not explained by any existing theory) Consider following demonstration (not explained by any existing theory)

(a) Consider a body of mass 1mg or 1kg or heavier having density 19,200 kg/m^3 (different shapes, distortion etc.) is dropped in water (1000kg/m^3), mercury (13600kg/m^3) and glycerine (1260kg/m^3) .How much distance is travelled by bodies in 3s ?
It is not experimentally confirmed yet. Thus study is incomplete.
(b) Consider a body of cork (240kg/m^3) of mass 10gm or 1kg or 5kg (different shapes, distortion etc.) is allowed to rise from the bottoms of tanks (different sizes) of water

(1000kg/m^3), glycerine (1260 kg/m^2) and mercury (13600kg/m^3).How much distance is risen by bodies in 3s?
It is not experimentally confirmed yet.

The glycerine has viscosity 1058 times more than water. So effect of viscosity can be checked using glycerine as medium.

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Generalization of 2265 years old Archimedes Generalization of Principle

9 Rigorous Requirement Of Alternate Theory

The rising, falling are most common phenomena in nature. We have no theory to explain them quantitatively. Thus an alternate theory on rising, falling and floating is developed taking all factors in account (i.e. mass, shape and angle at which body is dropped, magnitude, characteristics motion of medium and convectional currents etc.).

Typical observation: An airplane having density 8200kgm^{-3} float in air but a needle fall down. According to Archimedes both needle and plane should fall down?

Terms and new equations

The new coined terms are Hidden Ratio, Rising Factor and Falling Factor
Hidden Ratio (HR) = Density of medium / Density of body
= 1000kgm^{-3} /7500kg/m^{-3} = 0.133
If HR is more than one, body rises HR= [1000kgm^{-3} /cork(250kgm^{-3})] =4
If HR is less than one, body falls, HR=[1000kgm^{-3} /steel(7500kgm^{-3})] =0.133
If HR is equal to one, body floats
Rising Factor = HR-1 = 4-1 =3
Falling Factor = 1-HR = 1-0.133=0.87
When body floats HR is unity.

New Equations :

HR = $a_m D_m / a_b D_b =$
$x_m y_m D_m / x_b y_b D_b$

FF=1-HR= $(1 - x_m y_m D_m / x_b y_b D_b)$

RF=HR-1= $(x_m y_m D_m / x_b y_b D_b - 1)$

Distance travelled by falling body :

Distance travelled by falling body :

$$S = A(1 - x_m y_m D_m / x_b y_b D_b)t,$$

Distance travelled by rising body:

$$S = B(x_m y_m D_m / x_b y_b D_b - 1)t$$

x_m : Magnitude and shape of medium

y_m : State of motion, convectional currents, viscosity, surface tension and fluidity

x_b Magnitude of body

y_b : Shape, distortion of body, angle at which body is dropped

y_b : Shape, distortion of body, angle at which body is dropped

Thus estimating various values of x_i's and y_i's the distance traveled can be calculated.

Chapters of 'Beyond Newton and Archimedes'

1. 2360 Years Old Aristotle's Assertion Revalidated by Stokes Law
2. Construction of Water, Glycerine and Ethyl Alcohol Barometers
3. Archimedes Principle: The Oldest Established Law
4. The Generalized Form of Archimedes Principle
5. Prediction of Indeterminate Form Of Volume From
6. Archimedes Principle Is Stokes Law Applicable for Rising Bodies?
7. Limitation of Existing Theories and an Alternate Theory of Rising, Falling and Floating Bodies
8. Route to Newton's Laws of Motion
9. Experimental Confirmations of Equations of Conservation Laws in Elastic Collisions
10. Elastic Collisions in One Dimension and Newton's Third Law of Motion

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