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Does Brownian Motion *Really* Depend on Random Motion of Particles?

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In this paper the concept random is investigated, for the notable reason that it is based on probability rather than determinism. Is the question relevant? Can there be an alternative explanation? Are experiments biased by the theory?

The random movement of particles in fluids is called Brownian motion[1]. When particles in a fluid collider with fast-moving molecules the result is a random motion of these particles. The motion is not deterministic, i.e. the particles have what is called a random walk.

First I want to quote Einstein: "I, at any rate, am convinced that He (God) does not throw dice." Einstein in 1940 was pessimistic in finding the logical foundation for the theoretical foundation of physics and wrote: "Thus it is probably out of the question that any future knowledge can compel physics again to relinquish our present statistical theoretical foundation in favour of a deterministic one which would deal directly with physical reality".[2]

Now, it seems that Einstein embraced both views, i.e. the deterministic view and the random/probability view, based on the quote above and the fact that Einstein made calculations of the Brownian motion by using statistical theory of heat.

Is it possible to bridge these seemingly opposed views?

To illuminate the concepts of determinism and randomness I present three postulates[3]:

1) Nothing exists in isolation, i.e. everything exists in relations.
2) Every concept has to represent the physical reality directly.
3) The physical reality possesses different levels.

Postulate 3 implies different levels:

1) The fundamental level, which can be difficult to observe.
2) The surface level, which can be seen, by microscope, telescope or with our eyes.

Before we solve the problem by using concepts that directly represent the physical reality, we need a different theoretical approach.

Based on the first postulate we conclude that all parts and entities in the Universe hang together.

The concept relation relates to reality by demonstrating that there are relations between all parts in the Universe, formalized as aRb, where:

1) a, b, c … are any system, subsystem, unit or part, in any field of the Universe, e.g. suns, planets, moons, galaxies, leptons, hadrons, mesons, baryons, nuclei, atoms and molecules.
2) The relation R is a flow (wave) of packages, $p_{1\text{-}n}$, e.g. photons and electrons, between a, b, c …, in any field of the Universe.

Based on the postulate - *Nothing exists in isolation, i.e. everything exists in relations*- in combination with 1and 2 above, The Principle of Relations is X = aRb, where X stands for E (Energy), G (Gravitation) and F (Force).

Between all systems and between all parts of any system, S, there is a continuous flow of packages, and the formula is: S = $ap_{1\text{-}n}b$.

In experiments using a microscope it is possible to make particles with activity visible and then verify theories of the Brownian motion, as was done with Einstein´s theory.

Einstein used the kinetic theory, KT, to calculate the probability, P, of a particles movement over a certain distance, x, during some time, t, where the diffusion, D, is known.

Now we have two theories, both aspiring to explain the motion of particles, i.e. the random theories and the theory of relations, where the second is deterministic and the first is based on the postulate of randomness.

How, then, does aRb explain the motion of particles?

At *the fundamental levelthere are flows of packages*, e.g. rivers or winds that carry the smaller particles from one place to another, i.e. aRb. The validity of the random theories cannot be proven in any experiments, since the circumstances are manipulated according to the theory. Within aRb it is Nature that decides, i.e. at the fundamental level, while at *the surface level chaotic motion is admitted*.

Imagine sliding down a helter-skelter, wobbling from side to side, but still on your way down.

The apparently random motion is not random - all particles move from ***a*** to ***b*** - even if it looks chaotic. In Nature the particles don´t move as in an experiment, from one side to another, wobbling back and forth. In Nature there is always a direction for all particles. The experiment has nothing to do with the behaviour of nature.

The conclusion:

1) The Brownian motion, i.e. why particles move, depends on the flow of packages in nature.
2) The question concerning Brownian motion is not relevant.
3) The Kinetic Theory has to be discussed.

References

[1] A. Einstein, Annalen der Physik 17, 549, Brownian Motion. 1905.
[2] Albert Einstein: Out of My Later Years, 1956, at page 118.
[3] The article is based on the book *The Theoretical Foundation of Physical Reality. Thomas Nordström. Published by AuthorHOUSE 2020.*