

Historical burdens on physics

21 Actions at a distance

Subject:

Statements like “the Moon is attracted by the Earth”, “the sun exerts a force on the Earth”, “like poles repel each other, unlike poles attract each other”.

Deficiencies:

These statements suggest that there is an influence or action of one body A on another body B without the participation or mediation of a third system that connects A and B. Since the times of the introduction into physics of modern electrodynamics by Faraday and Maxwell, i.e. the first field theory, scientists are convinced that such actions do not exist and that such a description is inappropriate.

Origin:

The action-at-a-distance language that can be found in all physics text books dates from the times of Newton. Indeed, before the theory of Faraday and Maxwell came into being there was no other choice than imagine the electric, magnetic and gravitational forces as actions at a distance. Newton himself considered the actions at a distance a flaw of his theory.

Disposal:

As soon as gravitational, electric and magnetic forces between two bodies are discussed, the corresponding field is introduced as a third participant. The field is described as a system that is as real as the two bodies. The electric attraction or repulsion for instance is described in the following way: Two bodies with like charges are pulled away from each other by the field, bodies with like charges are pulled together.

Friedrich Herrmann, Karlsruhe Institute of Technology