Vilhelm Friman Koren Bjerknes

Souhrn (1862-1951)

Norský fyzik. Jeden ze zakladatelů moderní meteorologie, čili předpovědi počasí, a fyzikální hydrodynamiky.

Fields of force (Silové pole) - 1906

- Knina (pdf + kopie)

Popisuje proudění tekutin a jejich porovnání s elektromagnetismem včetně doprovodných ověřovacích pokusů.

Cituje Maxwella, který si byl vědom neúplnosti popisu elektromagnetismu:

> It must be carefully born in mind that we have only made one step in the theory of the action of the medium. We have supposed it to be in a state of stress but have not in any way accounted for this stress, or explained how it is maintained …
>
> I have not been able to make the next step, namely, to account by mechanical considerations for these stresses in the dielectric.

Přitažlivost a odpudivost dvou pulzujících/kmitajících těles

> Between bodies pulsating in the same phase there is an apparent attraction; between bodies pulsating in the opposite phase there is an apparent repulsion, the force being proportional to the product of the two intensities of pulsation, and proportional to the inverse square of the distance.
>
> Pulsating bodies act upon each other as if they were electrically charged particles or magnetic poles, but with the difference that charges or poles of the same sign attract, and charges or poles of opposite sign repel each other.
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> … the motion is not a simple progressive one, but a dissymmetric vibratory motion, in which the oscillations in the one direction always exceed a little the oscillations in the other, so that the result is the observed progressive motion.
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> An oscillating body will act upon a pulsating body as an elementary magnet upon a magnetic pole, but with the law of poles reversed.
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> An oscilating body in the hydrodynamic field will be subject to the action of a force similar to that acting upon an elementary magnet in the magnetic field, the only difference being the difference in the signs of the forces which follows from the opposite pole-law.

Vliv hustoty tekutiny

> The light body will move in the direction of decreasing, the heavy body in the direction of increasing energy of the field.

> … the light body will be repelled, and the heavy body attracted by the pulsating or the oscillating body.

Vzájemné působení přímých vírů

> … parallel vortices which rotate in the same sense, and which correspond thus to currents of the same direction, will repel, while vortices rotating in the opposite direction will attract each other.

Analogie mezi hydrodynamikou a elektromagnetismem

> Of course, if there exists a close analogy between hydrodynamic and electromagnetic fields, this analogy must be contained implicitly in the fundamental equations of the two kinds of fields, namely in the hydrodynamic equations of motion on the one hand, and in Maxwell's equations of the electromagnetic field on the other.
>
> We have succeeded in proving this : the vibratory hydrodynamic field has the same geometric configuration as an electrostatic or a magnetic field. In the hydrodynamic field there are forces whose resultant upon finite bodies oppositely corresponds to the corresponding resultant forces in the electric or magnetic field.
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> … we have no hydrodynamic analogy extending to the electromagnetic phenomena of the most general type …
>
> … stresses, even in Heaviside's theory, are introduced only to explain the visible motion observed in the field, not the formation or maintenance of the field itself.
>
> It may, therefore, be a question whether *this* will not be the great problem in the theory of electricity, to find a stress which accounts for both the formation and propagation of the electromagnetic field and for the visible motions of the charged or polarized bodies, just as the pressure in the fluid accounts for both the formation of the hydrodynamic field and for the visible motions of the pulsating or oscillating bodies.
>
> What should be the properties of a medium, whose fields shall give the completest possible analogy to electromagnetic fields?