Physicists have created a model of biological nanomotors

The team of Japanese and American scientists created a simple operating model that allows a better understanding of the principle of how biological nanomotors work, the researchers reported in their article preprint (lead author - Anatoly Smirnov), posted on arXiv.org.

Biological nanomotors are unique microscopic engines created by nature: ATP synthase and

bacterial flagellar motor, which makes possible for the bacteria to move independently in space.

The tip of the flagellum rotates through electrostatic interactions between its rolling grounds, which is about 50 nanometers in diameter (rotor), and still enshrined in the cell membrane complex (stator). The rotation is ensured by a transmembrane gradient of positive ions - Na^+ and, mainly, H^+ (protons). ATP synthase motor is arranged in a similar manner.

The model, created by the researchers, is a rotating ring (rotor) with three proton-binding sites. In the presence of a permanent electric field the gradient of protons leads to the effect that the model begins to rotate.

According to the researchers, the theoretical model and its description, unlike previous works on nanomotors satisfactorily explain how bacterial flagellar motor reaches exceptionally high performance: a torque about 2700-4600 piconewton per nanometer, and efficiency - about 90 percent. The model also shows how flagellar motor can quickly change the direction of rotation, which has so far remained unclear.

LINKS

- Unidirectional rotary nanomotors powered by an electrochemical potential gradient - ArXiv, 24.12.07 -- Unidirectional rotary nanomotors powered by an electrochemical potential gradient - ArXiv, 24.12.07

Links

- Frontier Research System, The Institute of Physical and Chemical Research (RIKEN) -- Frontier Research System, The Institute of Physical and Chemical Research (RIKEN)

URL: http://lenta.ru/news/2007/12/25/nanomotor/ URL: http://lenta.ru/news/2007/12/25/nanomotor/