



Saint Petersburg Electrotechnical University (LETI)

Bioelectric Body

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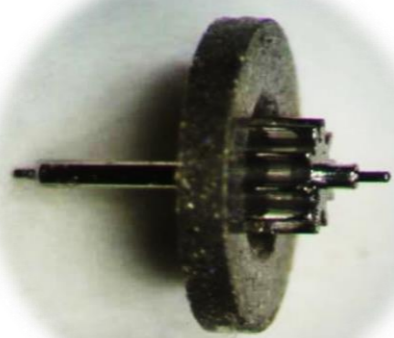


INTRODUCTION AND AIMS

Nowadays there are many Implanted medical devices like blood pressure sensors, drug-deliver pumps, glucose meters, or neurostimulators, all need just a tiny amount of energy to operate, but because they require either an external power source or a replaceable battery, they must be installed in easy-to-reach places in the body. Giving them their own power supply means they could be installed in more favorable positions to carry out their functions, and can eliminate periodic surgeries to install new batteries.

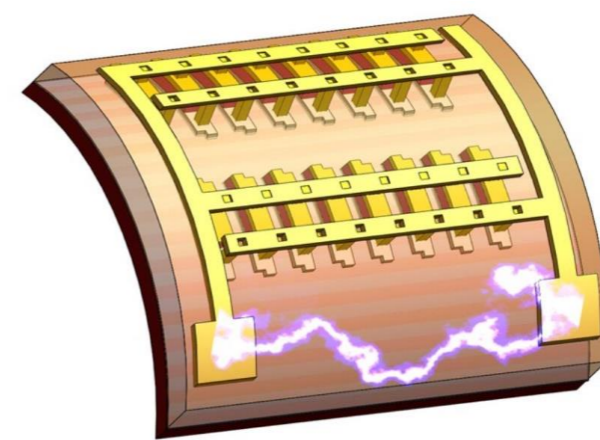
Methods

- Microbelt Device Generates Electricity from Human Respiration
- By Flexible Piezoelectric Ceramic
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- Body Heat as Power Source
- Stretchable Solar Cells for Electronic Skin



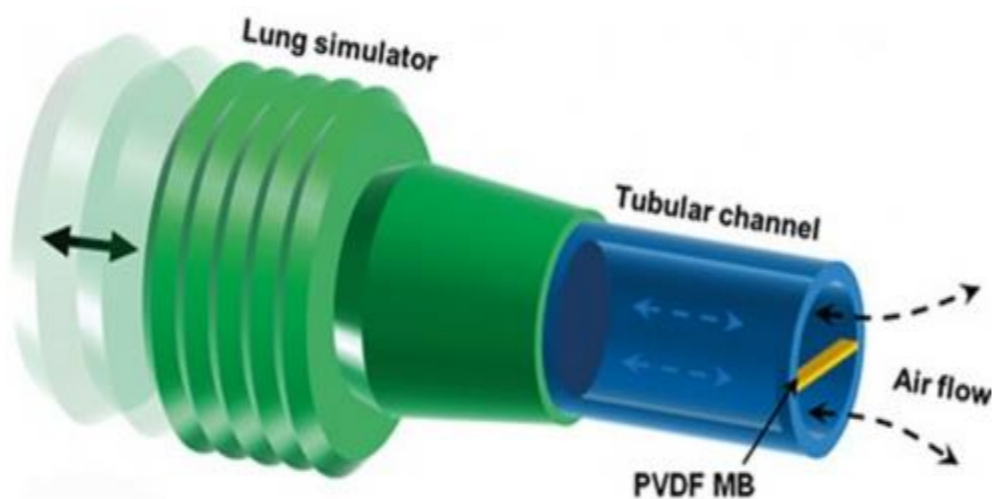
Vascular turbine generates power from blood flow

Our heart produces about 1 to 1.5 watts of hydraulic power. We can take Advantage of this power by putting a tiny turbine inside a human artery, like an implantable hydroelectric generator. The device in its current iteration harvest 800 microwatts of electricity from blood flow. Today, the microturbines' use cases are limited to powering blood-pressure sensors, drug-delivery pumps and neurostimulators all of which need a power source. In the future, the possibilities are more outlandish.



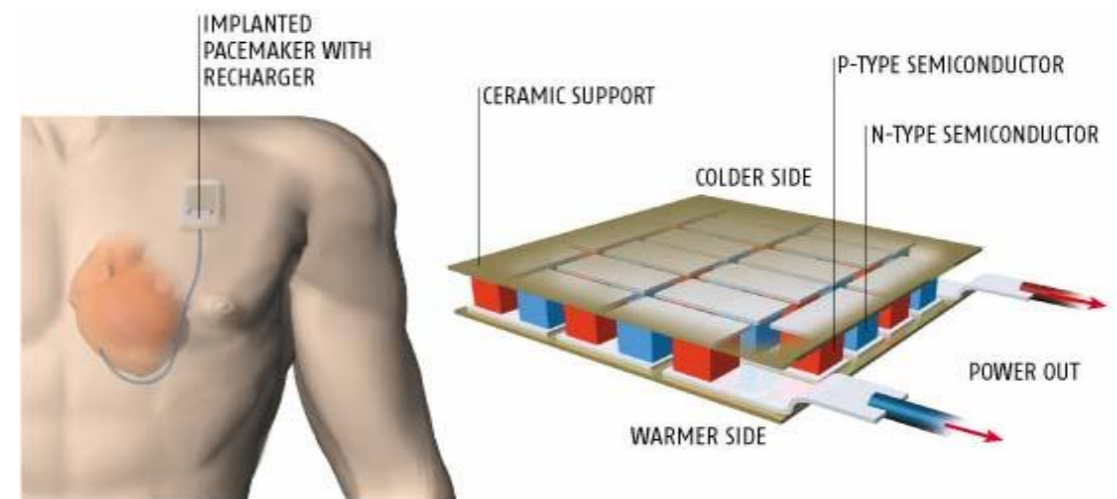
Flexible Piezoelectric Ceramic

Some flexible nanogenerator are introduced that converts small movements of the human body into electricity. It uses freely bendable piezoelectric ceramic thin film nano-material, which generates voltages when pressure or bending forces are applied such as wind, Vibration and sound, but also heart beats, blood flow and muscle contraction, can be used with this technology. Apart from medical applications, it might also be used to power personal mobile electronics or micro robots.



Microbelt Device Generates Electricity from Human Respiration

It is a small flexible device that can turn the airflow from human breath into electricity. The plastic micro belt is used made of polyvinylidene fluoride (PVDF) material that vibrates when passed by low-speed airflow & gives a piezoelectric effect & can generates power in order of millivolts.[2]

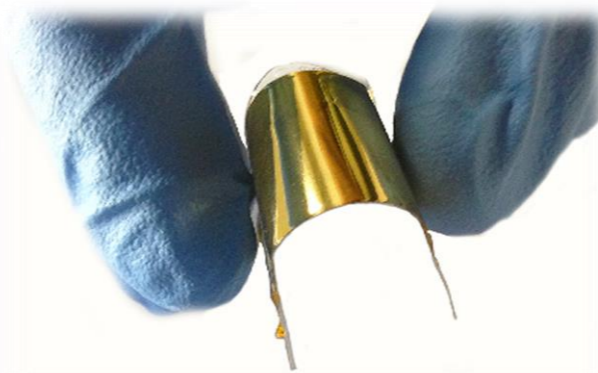


Body Heat as Power Source

'Nano-generators' or the thermoelectric generators, and made from semiconductor elements which are less heavy than the conventional energy sources like batteries. The device is a prototype Zinc oxide nanowire (a nontoxic agent), which extracts electrical energy simply from the change in temperature between a hot and a cold environment. It would normally produce only around 200 millivolt.

Stretchable Solar Cells for Electronic Skin

Sheet of stretchable nano solar cells has been developed which can be stretched up to 30 percent of their normal size and snap back without any damage. A wavy, accordion-like microstructure with a liquid metal electrode allows the solar cells to stretch along two axes. These stretchable solar cells can be used in fabrics for uniforms and other clothes.[1]



CONCLUSIONS

NASA also uses these sources of energy to fulfill the requirement of power in space and Armed forces can use these sources of energy in different critical situation like war and disasters.

Probably in near future self-powered device may be attractive for places without electric grid. 'To generate enough power for practical applications (such as in mobile phones, Implants etc), better materials and system designs are needed, and we all of them really need to working on it.

REFERENCES

- [1] <http://www.utilitydive.com/news/5-ways-you-can-use-the-human-body-to-generate-electricity/280709/>
[2] <http://www.gizmag.com/generating-electricity-from-respiration/20064/>