



Rajeev Bansal

Are You Well Grounded?

When I used to teach an undergraduate course in engineering electromagnetics, the following quiz [1] was a favorite of the students. Even my wife heard about it at the dinner table so often that she once concocted a topical poster for my office wall (see Figure 1).

A farmer and his cow are caught outdoors in a thunderstorm. A pine tree near them is struck by lightning. The cow is electrocuted, but the farmer survives to tell the tale. How?

- The cow presents a much larger capacitance than the farmer.
- The cow happens to be a bit closer to the tree.
- The cow's legs are too far apart.
- It is a totally random occurrence.

As students learned, the correct answer is c), the cow's legs are too far apart. Here is the explanation [1]:

The current from the lightning strike, which can be tens of thousands of amperes, passes into the earth at the base of the tree and spreads out radially in the top conducting layer of the ground. This sets up a potential gradient along the surface. The cow's foot near the tree will be at a much higher potential (depending on the ground resistance) than the foot

farthest away from the tree. Clearly, a current will flow through the cow from one end to the other and could well be fatal.

Imagine my surprise when I recently received a link to a paper [2] that talked about the therapeutic effects of ground currents flowing through the body. Here is the abstract:

This paper explores the electrical nature of sandy beach and proposes a pathway for the therapeutic effects of beachgoing. The electric potential and current generated on the ground across the human body and resistors were measured. The ground was found to have a nonhomogeneous electric potential which generated a potential difference between any two points on the ground. A power curve, similar to a battery, in the nanowatt range was obtained. This power appeared to be stable across time but varies across ground location. Standing on the beach with dry feet did not allow any current in the microampere range to conduct. But upon moistening the feet, the body electrical resistance was reduced by 94%, and *the ground potential difference across the two feet was sufficient to drive a microampere range current through the body. This may be one reason for the therapeutic effects of being on the beach.* [Italics has been intentionally added for emphasis.]

This purported explanation for the salubrious effects of taking a barefoot walk on the beach was news to me! When I looked more into the topic, I found my way to the website [3] of the Earthing Institute, with links to the book *Earthing* and many related publications. A companion commercial website [4] notes that

just as the sun gives us warmth and vitamin D, the Earth underfoot gives us food and water, a surface to walk, sit, stand, play, and build on, and something you never,



FIGURE 1. The cow is electrocuted but the farmer survives to tell the tale.

never thought about—an eternal, natural, and gentle energy.

It adds,

Being isolated from the earth by nonconductive materials such as wood, tile, and carpeted floorings in our homes, as well as rubber and plastic in our shoes, leaves us feeling unhealthy ... [but] when we make direct contact with the surface of the Earth, with our bare feet or hands, our bodies receive a charge of energy that makes us feel better, fast.

The site offers kits to let you start earthing indoors and includes the following guarantee:

Earthing products connect the body to the Earth's energy. We guarantee that connection. There is no guarantee as to how an individual may respond to Earthing and Grounding once that connection is made. Earthing products are not a substitute for medical treatment. Individual results of grounding may vary.

A walk on the beach (except under a stormy sky) works well enough for me!

ACKNOWLEDGMENT

I would like to thank fellow IEEE Committee on Man and Radiation

(COMAR) members for bringing the topic to my attention by posting links to [2] and [3] to the COMAR distribution list.

REFERENCES

- [1] R. Bansal, "Zapped," *IEEE Potentials*, vol. 19, no. 2, pp. 5–6, Apr./May 2000.
- [2] S. Neoh, "Exploratory study on the natural ground current that flows through human body as a possible pathway for the therapeutic effects of beach going," *Complement. Ther. Med.*, vol. 41, pp. 161–168, Dec. 2018.
- [3] The Earthing Institute. Accessed on: Nov. 1, 2019. [Online]. Available: <https://earthinginstitute.net/>
- [4] Earthing. Accessed on: Nov. 1, 2019. [Online]. Available: <http://www.earthing.com/pages/what-is-earthing>



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