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ALESSANDRO VOLTA AND HIS ROLE IN THERMOELECTRICITY

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In recent years, in a number of publications attention is drawn to the fact that, apparently, it is not Seebeck who is a pioneer in thermoelectricity, but Volta [1–4]. In this paper we again dwell on this subject, since many in the scientific community are not aware of the fact of thermoelectricity discovery by Volta, and others treat it with distrust.

First, about Seebeck. It is generally known that Seebeck studied the possibility of magnetic field origination under the effect of temperature difference and he called this effect thermomagnetism (Fig. 1). In this way, actually Seebeck could claim to formal discovery of magnetic field origination in materials that are under nonisothermal conditions.

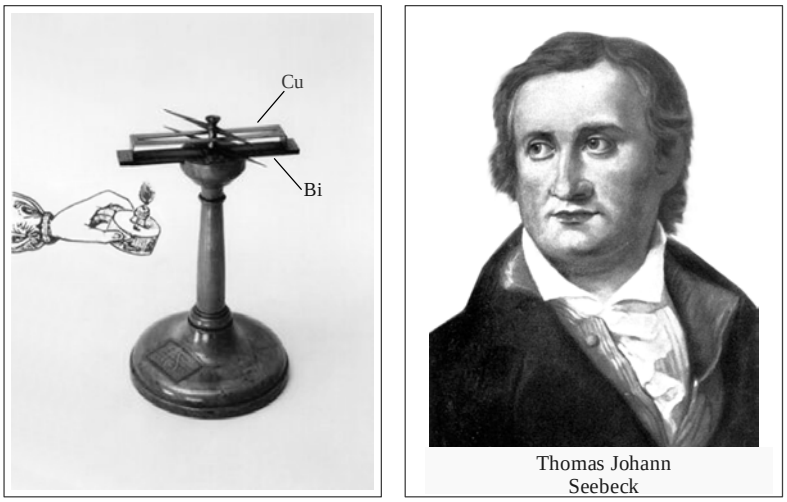

Fig. 1. Seebeck's device for observation of thermomagnetic effect.

It is a matter of common knowledge that the electrical nature of Seebeck's thermomagnetic effect was established by Oersted (Fig. 2).

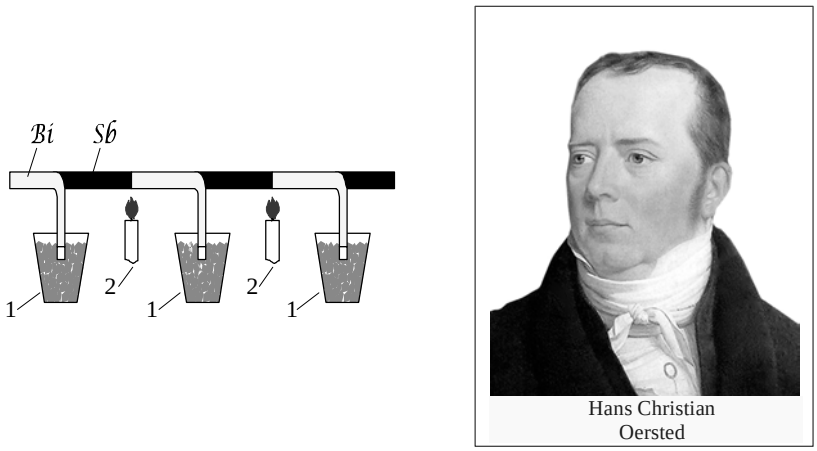

Fig. 2. Oersted's thermoelectric generator:
1 – melting ice; 2 – gas burners.

It was Oersted who actually created the first thermocouple, it was Oersted who suggested that the effect of origination of electromotive forces due to temperature difference should be given the name thermoelectricity. To the end of his life Seebeck did not recognize the results obtained by Oersted, and, hence, did not recognize thermoelectricity itself. Therefore, Seebeck can be called a pioneer of thermoelectricity very tentatively, remembering the merits of Oersted.

This uncertainty in defining the pioneer of thermoelectricity called for further studies and resulted in the fact that actually the effect of electric voltage generation due to temperature difference belongs to famous Italian scientist Volta (Fig. 3). For his investigations, as electric voltage indicator, Volta used a prepared frog that contracted when exposed to contact potential difference. In the process, Volta clearly established that the reason for contraction of frog muscles is not animal electricity as it was supposed by Galvani, but the properties of material pairs.

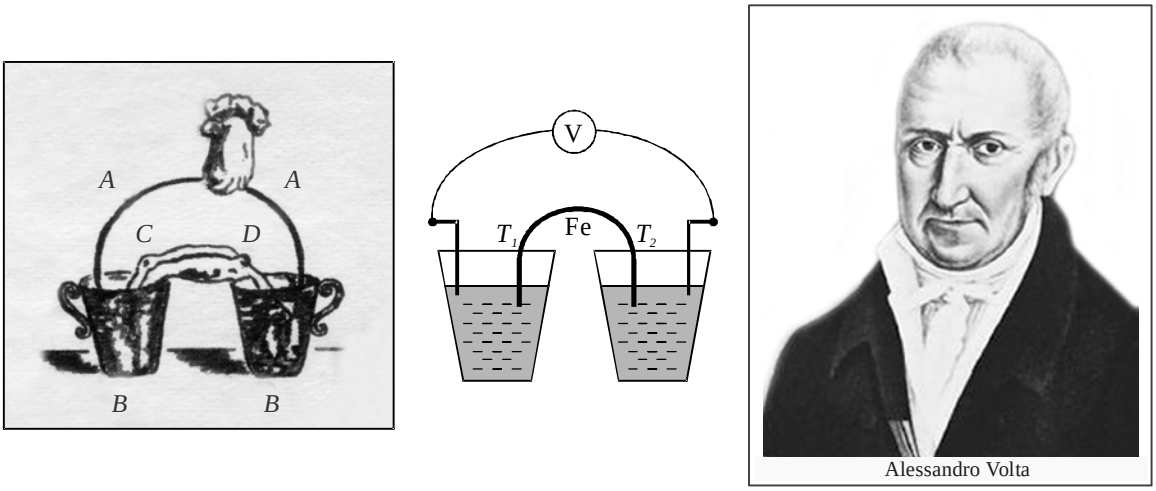

Fig. 3. Discovery of thermoelectricity by Volta on February 10, 1794.

In one of his experiments, Volta used one metal conductor, and, as is shown in the figure, he observed contraction of muscles even from a single conductor. Volta correctly concluded that contraction of muscle from one conductor was caused by conductor inhomogeneity. This showed deep understanding by Volta of the physical reason for this experiment. So, in his investigations Volta started looking for, and he did find such conductors that did not cause contraction of frog legs and could be considered homogeneous. This enabled him to observe in pure form the origination of electromotive force, when the conductor ends were under nonisothermal conditions. Volta heated one of the wire arc ends and placed both into a glass with water, and in this case he observed contraction of frog's muscles. Volta arrived at correct conclusion that the reason for electromotive force is temperature difference. Thus, it was exactly Volta who, apparently, discovered thermoelectricity 23 years earlier than Seebeck.

Volta reported on his observations on February 10, 1794. It happened exactly 215 years ago. So, today we have started the work of the Forum on the birthday of thermoelectricity. To fix the priorities of Volta, the International Thermoelectric Academy made a decision to hold international workshop in the city of Como, the birthplace of Volta. I was entrusted by the International Thermoelectric Academy to organize this workshop.

The objectives of the workshop concerned the desire to clarify the role of Alessandro Volta in the discovery of thermoelectricity, as well as the promotion and development of this technology in Italy.

The workshop was given the title: "Thermoelectricity: from Alessandro Volta to nanotechnology". This is because no one knows anything of thermoelectricity, and no one talks about

it (the general public confuses it with combustion power station), while everyone talks about nanotechnology, even if no one knows anything!

In the municipality of Como they were immediately interested in the idea of holding the workshop, they welcomed this event with surprise, but with a big enthusiasm, making available the council room in the municipality site (Fig.4).

Fig.4. International workshop in the municipality of Como, devoted to discovery of thermoelectricity by Volta, July 14, 2005.

The workshop was held on July 14, 2005, and its central moment was transfer of the commemorative plaque from the ITA President Prof. Anatychuk to the mayor of Como Dr.Stefano Bruni (Fig. 5).

Fig. 5. Commemorative plaque in the Temple of Volta, Como, confirming discovery of thermoelectricity by Volta.

Then, in his interesting report Prof. Anatychuk reminded of the origins and recent developments of these technologies.

Finally, a round table discussion ”Thermoelectricity in everyday life” was held with the purpose to make understandable the application of thermoelectric technology.

In the afternoon, the commemorative plaque installation procedure took place in the Temple of Volta (Fig.6, 7).

Fig.6. Commemorative plaque in the Temple of Volta, dr. Lanfredo Castelletti, Como community museum, confirming discovery of thermoelectricity by Volta.

Fig.7. Temple of Volta.

Lots of articles dedicated to this event appeared in the local printed media to remind the importance of Alessandro Volta as scientist.

Thus, the workshop was quite a success and attracted public attention to Volta as the pioneer of thermoelectricity.

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Submitted 10.02.09.