Nomination form
International Memory of the World Register

Three documents related to the two most outstanding results of the work of Roland Eötvös

ID Code [2014-54]

1.0 Summary (max 200 words)

Scientists involved in basic research connect Eötvös' name, above all, with his investigations into the equivalence of gravitational and inertial masses. Rather than the pendulum that had been used to that point, Eötvös made use of a torsion balance for his experiments, which allowed him to raise the precision of measurement up to 1/200,000,000. This experiment received very considerable international recognition, winning him the Beneke Prize of the University of Göttingen in 1909.

Document 1 is an original manuscript of the prize-winning paper written by Eötvös in 1908. An abbreviated version of this document was published much later, in 1922.

Documents 2.a and 2.b are commercial brochures for asymmetric torsion balances, printed in the 1920s. They illustrate how Eötvös' original concept – that this sophisticated instrument is suitable for geological exploration – was successfully put into practice. Through the development of such field equipment, a new branch of Applied Geophysics was born, enabling the exploration of the deep structure of sedimentary basins.

The appearance of the first series of commercially available torsion balances marked a significant advance in the new and rapidly developing instrument manufacture and data acquisition industry in geological exploration across the globe.

2.1 Name of nominator (person or organization)

Geological and Geophysical Institute of Hungary

2.2 Relationship to the nominated documentary heritage

owner and custodian

2.3 Contact person(s) *(to provide information on nomination)*

Mrs. Klára Palotás

2.4 Contact details

Name
Department of Geological and Geophysical Collections, Geological and Geophysical Institute of Hungary

Address
Stefánia út 14., 1143 Budapest, Hungary
Internet: http://www.mfgi.hu

Telephone
(+36-1) 251 0999

Facsimile
(+36-1) 251 0109

Email
titkarsag@mfgi.hu

3.0 Identity and description of the documentary heritage

3.1 Name and identification details of the items being nominated

If inscribed, the exact title and institution(s) to appear on the certificate should be given

Document 1:
An original manuscript of the paper that won the Beneke Prize of the University of Göttingen, written in German by Professor Roland Eötvös in 1908, which begins with the sentence: "Die Aufgabe, wie die hier aufgefasst und behandelt werde".

Description: the manuscript (draft) comprises 91 pages, dimensions 17 x 21 cm.

Identity.: 2008.23.1

Owner and custodian: Geological and Geophysical Institute of Hungary [established through the merger of the Eötvös Loránd Geophysical Institute and the Geological Institute of Hungary in 2012].

Document 2.a:
Commercial brochure, printed in the U.S.A. between 1926 and 1927, bearing the following text on the cover: "GRAVITATIONAL TORSION BALANCE - ORIGINAL MODELS *of the* Baron Roland Eötvös Geophysical Institute, Budapest, Hungary; *Made in the* Süss Institute for the Precision Mechanics and Optics Company, Ltd. Budapest, Hungary – *Exclusive American Representative* Dr. George Steiner, 1802 California Street, Houston, Texas"

Description: the booklet comprises 17 numbered pages, dimensions 14.8 x 22.3 cm.

Identity.: 2008.24.1

Owner and custodian: Geological and Geophysical Institute of Hungary

Document 2.b:
Commercial brochure, printed in Hungary in 1928, bearing the following text on the cover: "THE SMALL ORIGINAL EÖTVÖS TORSION BALANCE – Ferdinand Süss Precision Mechanical and Optical Works Limited, Budapest I. (Hungary)".

Description: the booklet comprises 12 numbered pages, dimensions 22.5 x 30 cm.

Identity: Ms 5890/67

Owner and custodian: Archives of the Academy, Library and Information Centre of the Hungarian Academy of Sciences

Description of the publications and contents of the documents

1. An original manuscript – beginning with the sentence "Die Aufgabe, wie die hier aufgefasst und behandelt werde" – written in 1908 by Roland Eötvös, Professor of Physics of Budapest University of Sciences, for submission to the Beneke competition of the University of Göttingen. The draft of the prize-winning paper summarises the results of a high precision torsion balance experiment to measure the ratio of gravitational and inertial masses. The award of the Beneke Prize – together with the laudation of the winning paper – was made by C. Runge, Dean of the Faculty of Philosophy of the University of Göttingen, in 1909. An abbreviated version of the paper was only published by his colleagues (D. Pekár and E. Fekete) much later in 1922, due to the enormous effort made in connection with the development and industrial application of the torsion balance, the intervening First World War and Eötvös' death in 1919.

The manuscript is written in German and comprises 91 pages. It is sadly incomplete as the first - and a number of other - pages are missing. The recent numbering is placed in the lower right-hand corner, while the contemporary numbering in the upper right-hand corner is either confused or absent.

2. Two original (and quite rare) commercial brochures printed in the 1920s, which document how an

extremely accurate scientific instrument (the asymmetric torsion balance) designed by Roland Eötvös – based upon his early recognition that this device is suitable for geological (and oil) exploration – was successfully introduced into industrial application. His invention was an early, original, basic and groundbreaking contribution to the young science of Applied Geophysics. These two brochures illustrate how the creation of this science was followed by the birth of the new industry of instrument manufacture and data acquisition in the field of geological exploration.

The latest dates given in the brochures are 1925 and 1928, respectively. In brochure 2.b, pictures are included that were taken during the 1926 Upper Assam (India) geophysical expedition led by Dezső Pekár, the first Director of the Geophysical Institute after Eötvös' death.

3.4 History/provenance

The manuscript (document 1) has recently been found, after being hidden away for several decades. The finalised text submitted by Eötvös and his co-authors to the Beneke competition and the official documents of the awarding of the prize – unfortunately – have been lost. The existence and "loss" of the manuscript was reported by Péter Király in 2007: "*Unfortunately, the detailed record of the observations has been lost, and the submitted paper has also disappeared, however, Pál Selényi, editor of the Collected Papers of Eötvös, published in 1953, could already reconstruct some parts of it, that were omitted from the 1922 paper.*" (Péter Király: The 100-year old Eötvös-Pekár-Fekete experiments and their effects to date [written in Hungarian] Fizikai Szemle 2007/1, p. 1, http://www.kfki.hu/fszemle/archivum/fsz0701/kiraly0701.html**)**

Documents 1. and 2.a. are part of the primary personal legacies of Roland Eötvös and Dezső Pekár, respectively. Dezső Pekár was the successor to Eötvös as head of the Institute. Both legacies were left to the "Baron Eötvös Loránd Geophysical Institute", as it was known after Pekár's promotion. The Nominator (Geological and Geophysical Institute of Hungary) is the legal successor of the Eötvös Loránd Geophysical Institute.

Document 2.b: The Library and Information Centre of the Hungarian Academy of Sciences purchased this brochure from Zsuzsa Pekár, daughter of Dezső Pekár, in 1992 (Acquisitions Log No. 22/1992).

4.0 Legal information

4.1 Owner of the documentary heritage (name and contact details)

NOMINATOR is the Owner (and Custodian) of documents 1. and 2.a.

Name and contact details of the NOMINATOR are given far above, in articles 2.1 - 2.4.

Owner (and Custodian) of document 2.b is given below:

Name: Library and In- formation Centre of the Hungarian Acad. of Sci.	Address Széchenyi István tér 9., 1051 Budapest, Hungary Postal address: P. O. Box 1002, H-1245 Budapest, Hungary

Telephone	Facsimile	Email
(36-1) 441 6143	-	acadarchiv@konyvtar.mta.hu

4.2 Custodian of the documentary heritage (name and contact details if different from the owner)

Name	Address
Name as above	

Telephone	Facsimile	Email

4.3 Legal status

Provide details of legal and administrative responsibility for the preservation of the documentary heritage

Ownership category: public institution (all documents)

Responsible administrators:

Geological and Geophysical Institute of Hungary (documents 1. and 2.a)

Library and Information Centre of the Hungarian Academy of Sciences (document 2.b)

4.4 Accessibility

Describe how the item(s) / collection may be accessed

In the case of documents 1 and 2.a: physical access is very limited because the documents are unique. Access in digital form is the only available alternative.

In the case of document 2.b: the document is accessible in person at a public library during normal office hours. Access in digital form would assure worldwide availability.

All access restrictions should be explicitly stated below:

- see above -

4.5 Copyright status

Describe the copyright status of the item(s) / collection

The nominated documents are not subject to copyright.

(Users are requested to refer to the owner, in accordance with the CC [Creative Commons] licence convention.)

5.0 Assessment against the selection criteria

5.1 Authenticity.

Roland Eötvös – as a politician, academic and highly educated, high profile, leading intellectual of Hungarian public life (aristocrat, minister, President of the Hungarian Academy of Sciences and university professor) – has left behind him a considerable number of handwritten manuscripts. No-one has yet brought into question (and anyone can check this very easily at any time) the authenticity of the nominated manuscript.

5.2 World significance

1. In his time, Eötvös' experiment was one of the highest precision measurements in Physics. The equivalence of gravitational and inertial mass became an essential element of Einstein's theory of general relativity (see references 5 and 6 in Section 3.5).

2. As a professor of Physics, Eötvös first began to deal with the Coulomb (known also as the Michell or Cavendish) torsion balance in order to demonstrate the phenomenon of gravity and to study the ratio of gravitational and inertial masses around 1886. So as to establish the theory, he drew up the equation of the device, from which it became clear that the equilibrium position of the balance when left alone depended upon the shape of the niveau surface of the gravity field, i.e. the shape of the Earth. On the basis of the theory, he recognised that the torsion balance would also be sensitive to the horizontal gradient of the gravity force, if one of the masses at the two ends of the horizontal bar of the balance was suspended at a lower level by a thin thread. The asymmetric design of the device later led it to be termed the Eötvös torsion balance.
This design was an early, original and fundamental contribution to Applied Geophysics.

3. An indication of the groundbreaking nature of Eötvös' work is that the new scientific method could bring about an original, new industry. In 1922, just a few years after his death, the assembly line production of torsion balances was started by his former colleagues and Ferdinand Süss. Experts and technicians from all over the world came to the Eötvös Institute in Budapest to learn the handling and application of the device. The commercially available, high quality torsion balances manufactured in Budapest, Hungary clearly mark the beginnings of a new and rapidly expanding industry. The application of Eötvös torsion balances produced many oil discoveries around the world, chiefly in the 1920s and 30s.

5.3 Comparative criteria:

Does the heritage meet any of the following tests? (It must meet at least one of them.)

1 Time

a) Eötvös' first paper, related to his torsion balance experiments on the proportionality of gravitational and inertial masses, was published in 1890. These experiments – which improved the accuracy of former measurements more than three-fold – took the hypothetic *equivalence principle* into the domain of hard experimental facts, ensuring its consideration in any theories of gravity.

b) The first experimental field data acquisition with the torsion balance was conducted in 1891 (Ság mountain), followed by a number of campaigns in geological exploration. A survey was made of a producing oil field (Egbell, today Gbely) in 1916, which proved the excellent applicability of the instrument for outlining geological structures (anticlines and salt domes) buried by young sediments.

The two statements above demonstrate the pioneering role of Eötvös in both fields. Both the experiment and the asymmetric torsion balance represented original and brilliant new ideas at the time.

The torsion balance was the first available geophysical equipment suitable for exploring the deep geological structures of vast sedimentary basins. Eötvös' achievements were just the forms of innovation the mining industry was in need of.

2 Place

Evolving applied geophysics and the geophysical industry – given the global economy and worldwide access to oil, gas and mineral deposits in general – obviously lend global significance to any innovations in these fields. The application of torsion balances resulted in many oil discoveries all over the world.

3 People

The oeuvre of Eötvös is significant both from the point of view of natural sciences (Physics, Geophysics, Geodesy) and industry. It represents the highest scientific and human qualities.

4 Subject and theme

N/A-

5 Form and style

The theory and mechanical design developed by Eötvös were so elegant, robust and perfect that almost all further development proved to be dead ends. Eötvös' followers only managed to organise manufacture, add some auxiliary clockworks to automate the rotation of the device between observations and solve photographic recording.

As regards industrial design (aesthetics), the original Eötvös torsion balances can be described as simply beautiful and artistic; a perfect synthesis of functionality, simplicity and sophistication.

6 Social/ spiritual/ community significance:

N/A

6.0 Contextual information

6.1 Rarity

Document 1 is unique and irreplaceable, as only an abbreviated version of it was published after Eötvös' death, by his colleagues. However, no-one doubts that the published part contains all of the essential points of it and no systematic research has been done to date to disprove this hypothesis.

Documents 2.a and 2.b are very rare.

6.2 Integrity

The integrity of document 1 is not perfect. The first (it probably only contained the title) – and a few other – pages are missing.

Documents 2.a and 2.b are in satisfactory condition.