

The Roland Eötvös100 Commemorative Year

László SZARKA

Chair, Eötvös 100 Coordination Team

Egbell/Gbely, 17 October, 2019

Orosz István:
Eötvös Loránd

Eötvös Loránd

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1EÖTVÖS

www.eotvos100.hu



United Nations
Educational, Scientific and
Cultural Organization

Egyesült Nemzetek
Nevelésügyi, Tudományos és
Kulturális Szervezete

100th anniversary of Roland Eötvös
(1848-1919), physicist, geophysicist,
and innovator of higher education
Commemorated in association with UNESCO

Eötvös Loránd (1848-1919) fizikus,
geofizikus és a felsőoktatás
megújítójának 100. évfordulója
Az UNESCO-val közösen emlékezve

EÖTVÖS Loránd: his Hungarian name

Roland EÖTVÖS: his international author's name

1. Family background and CV
2. Achievements: concepts and terms named after him
3. The Eötvös 100 Commemorative Year

1. Family background and CV

The Vásárosnaményi Baron Eötvös family (Bereg county, NE-Hungary)

Great-great-grandfather: Miklós Eötvös (1716–1783): *General of the Cavalry, Baron from 1768*
Great-grandfather: Ignác Eötvös (1763–1838): *Doctor of Arts, Royal Majesty, Under-Sheriff*
Grandfather: Ignác Eötvös (1786–1851): *Doctor of Philosophy and Law, Treasurer Master, Vice-Chancellor*
Father: József Eötvös (1813–1871): *Lawyer, Writer, Minister of Public Education and Religion, President of the Academy*

Father:

József Eötvös (1813–1871)



Mother:

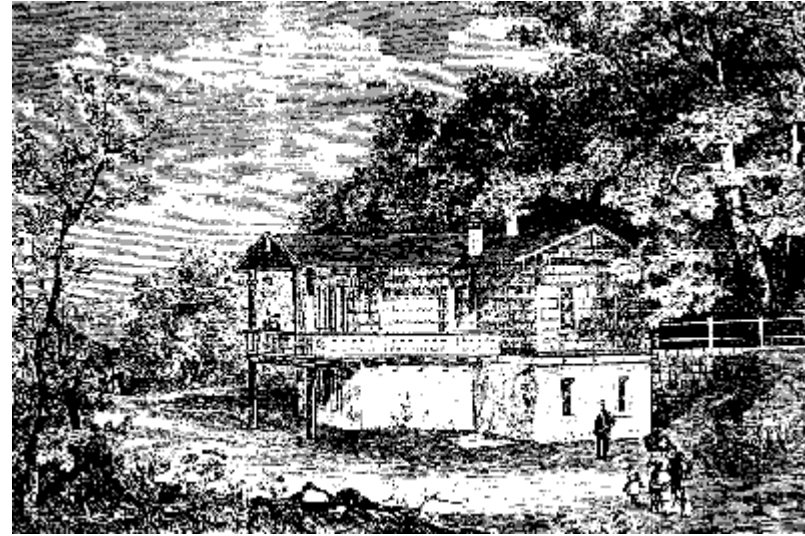
Ágnes Rosty (1821–1913),
Daughter of Albert Rosty
(1779–1847)
Unter-Sheriff in Békés

József Eötvös and Ágnes Rosty married in 1842 and had four children:

Ilona (1846–1924), Jolán (1847–1909), **Loránd (1848–1919)**, Mária (1851–1928)



József Eötvös with his son
Vasárnapi Újság (Sunday News), 1860



Loránd was born in
Buda, 27 July, 1848

„Ambition and sense of duty, which binds not only to a privileged nation, but to the whole of mankind, were born with me. To satisfy these two aspirations, and to satisfy my individual independence is my life goal; and at least so far I've found that I can answer it the most if I enter the scientific career.”

From the letter of Roland Eötvös to his father
28 March, 1866



1858 (by Gusztáv Keleti)



Student in Heidelberg

**Roland EÖTVÖS Loránd
(1848–1919)**



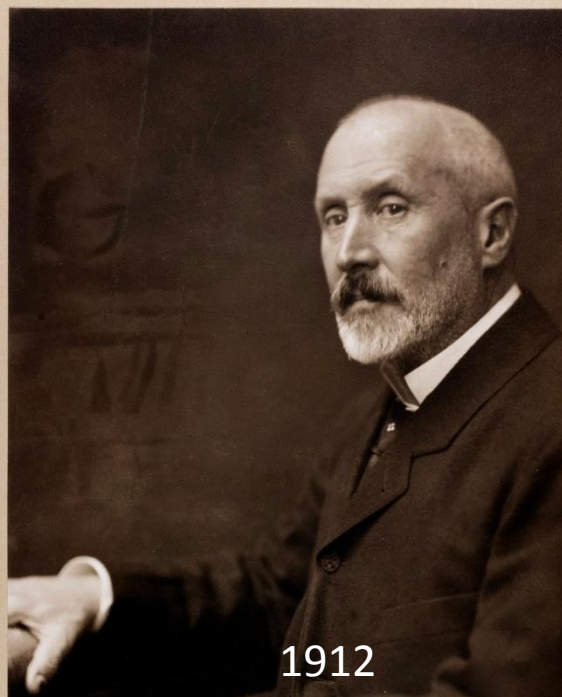
Young professor



1896



1905

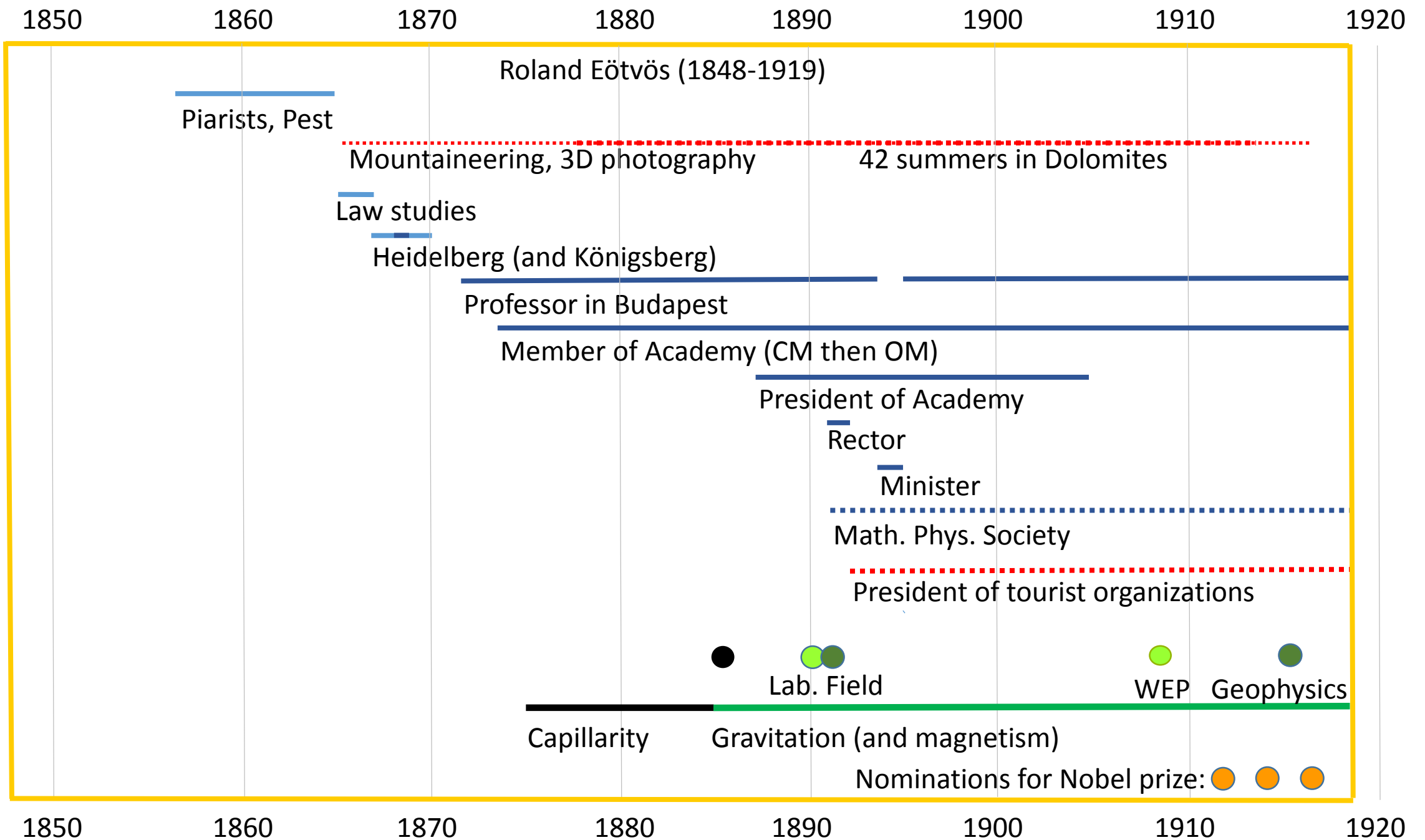


1912



1919

Married in 1876 with Gizella Horváth (1853–1919)
Daughters: Jolán (1877–1879), Rolanda (1878-1952), Ilona (1880–1945)
Eötvös did not have any grandchildren



2. Achievements: concepts and terms named after him

SCIENTIFIC CONCEPTS AND TERMS NAMED AFTER ROLAND EÖTVÖS

Capillarity (surface tension of liquids):

Eötvös rule (Eötvös law)

Eötvös constant

Eötvös number

Weak equivalence principle
(inertial/gravitational mass
proportionality):

Eötvös experiment

(EPF or Eötvös-type experiment)

Eötvös parameter

Laboratory and field instrument:

Eötvös torsion balance

(Eötvös pendulum)

Geodesy:

Eötvös tensor

Gravitation on a rotating planet:

Eötvös effect

Eötvös correction

Gravity and magnetism:

Eötvös law of magnetism

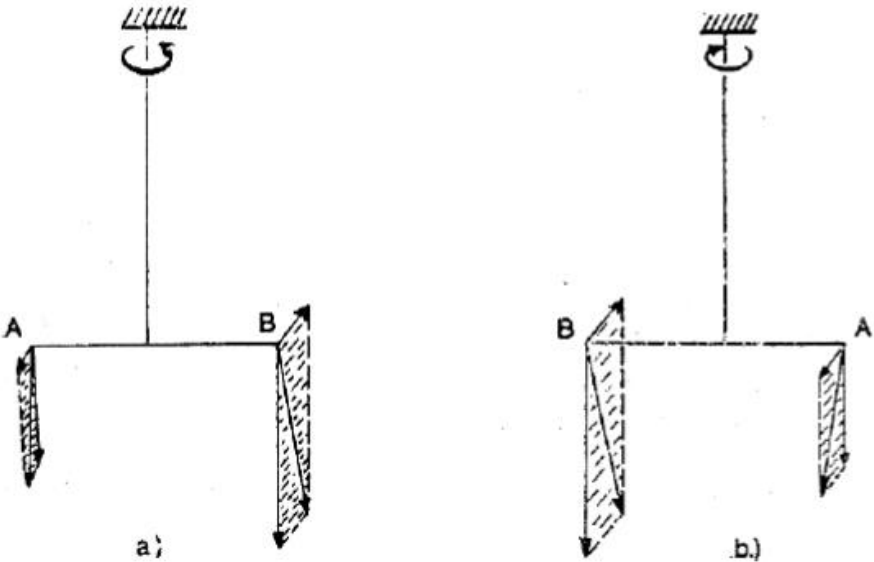
(the Poisson-Eötvös relationship)

Eötvös's Law of Capillarity states the relationship between the surface tension of a liquid and the temperature of a liquid. In particular, we have

$$\gamma = k(T_0 - T)/\rho^{3/2},$$

where the surface tension γ (also called the capillarity constant) of a liquid is related to its temperature T , the critical temperature of the liquid (T_0), and its density ρ . The constant k is approximately the same for many common liquids such as water. Note that T_0 is the temperature at which the surface tension disappears or becomes zero.

Eötvös rule (Eötvös law)



Eötvös experiment
(EPF or Eötvös-type experiment)

$$\frac{(m_g/m_i)_1 - (m_g/m_i)_2}{[(m_g/m_i)_1 + (m_g/m_i)_2]/2}$$

Eötvös parameter

$$k=2.1\times 10^{-7} \text{ J}/(\text{K}\cdot\text{mol}^{2/3})$$

Eötvös constant



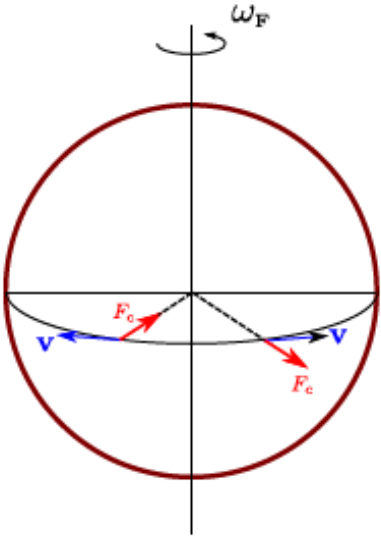
Eötvös torsion balance
(Eötvös pendulum)

Gravitational force/surface tension
Georgescu, Achard (2004): Eötvös published his results 50 years earlier than Bond; the name „Bond number” is new (1978)

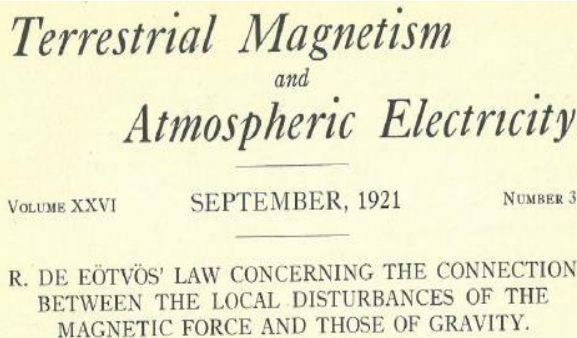
Eötvös number

$$\begin{bmatrix} dg_x \\ dg_y \\ dg_z \end{bmatrix} = \begin{bmatrix} W_{xx} & W_{xy} & W_{xz} \\ W_{yx} & W_{yy} & W_{yz} \\ W_{zx} & W_{zy} & W_{zz} \end{bmatrix} \begin{bmatrix} dx \\ dy \\ dz \end{bmatrix}$$

Eötvös tensor



Eötvös effect
Eötvös correction



Eötvös law of magnetism
(the Poisson-Eötvös relationship)

Physical unit

eötvös (unit)

The eötvös (or eotvos, E): unit of acceleration divided by distance. $1 \text{ eötvös} = 1 \text{E}=10^{-9} \text{ s}^{-2}$

Nature forms named after Roland Eötvös

Mineral

Lorándite

Lorándite is a mineral (thallium arsenic sulfosalt, 1894), being used for detection of solar neutrino

Mountain peak

Eötvös Peak (Cima di Eötvös, Eötvösspitze)

The Eötvös Peak is the second highest, or south-western Cadin peak in the Dolomites (2837 m)

Routes, caves etc.

Via Eötvös (≠Via Eötvös Dimai)

First climbing route of Croda da Lago. (Via Eötvös Dimai is named after his daughters.)

Eötvös-út (Eötvös Loránd-turistaút, Etveska, Eötvösova cesta)

A hiking trail above Banská Stianica (Selmečbánya, Schemnitz), named after Roland Eötvös (1896)

Eötvös caves

Aggtelek Karstic Mts and Krecsunesd / Crăciunești (Șura de Sus)

Moon crater

Eötvös crater

The Eötvös crater is the remains of a lunar impact crater on the far side of the Moon. It lies to the north-northwest of the walled plain Roche, and east-southeast of the equally ruined Bolyai.

Asteroid

12301 Eötvös

12301 Eötvös is a main belt asteroid with an orbital period of 3.65 years (1991).

3. Eötvös 100 Commemorative Year (more than 100 events through 2019, Hungary and abroad)

Báró Eötvös Loránd (1848-1919, Baron Roland von Eötvös) was contemporary – among others – of the Austrian Eduard Suess (1831–1914), the Croatian Andrija Mohorovičić (1857–1936), and the Serbian Milutin Milanković (1879–1958).

Significance of Eötvös in 2019

For physicists: The Eötvös experiments are of crucial importance in modern theoretical (gravitational) physics.

For earth scientists: Roland Eötvös represents a cohesion force in the Carpathian Basin.

He deserves to be a role model.

Eötvös 100 Honorary Board Members

ADELBERGER Eric, COLOMBO Oscar L., DOMOKOS Gábor, FISCHBACH Ephraim, von FRESE Ralph, GOMBOSI Tamás, MÉSZÁROS Péter, MÉTRIS Gilles, MILGROM Mordehai, MILYUKOV Vadim, NAGY F. András, University of Michigan, RODRIGUES Manuel, TOUBOUL Pierre, VERLINDE Erik, WEISS Rainer, WETTERICH Cristoph, WILL Clifford M. etc. physicists,

BEER Tom, BERNABINI Marcello, BIELIK Miroslav, BRIMICH Ladislav, CLOETINGH Sierd, DOGLIONI Carlo, GRAFAREND Erik W., GROTEN Erwin, HAJNAL Zoltán, HIRT Christian, HOLOTA Petr, KALAB Zdenek, KAUTZLEBEN Heinz, LÜHR Hermann, MARKOVIČ Slobodan, MEURERS Bruno, MOCANU Victor, MORITZ Helmut, MUELLER Ivan, MÜLLER Jürgen, NAGY Dezső, PASTEKA Roman, EGLI Ramon, RUMMEL Reiner, RYBACH Ladislaus, SANSÓ Fernandó, SCHUH Harald, SIDERIS Michael, SNEEUW Nico, TORGE Wolfgang, VANÍČEK Petr, WHALER Kathy etc. earth scientists.

PARTNERS AND SUPPORT

The Eötvös 100 is realized by the Hungarian Academy of Sciences, Eötvös Loránd University, Hungarian National Commission for UNESCO, Eötvös Loránd Physical Society, Association of Hungarian Geophysicists, and many other organizations.

Support: Ministry for Innovation and Technology, Ministry for Human Resources, National Cultural Fund of Hungary, National Research and Development Office

Natural scientists in the Eötvös 100 Coordination Team (info@eotvos100.hu)

Jenő Sólyom physicist,

András Patkós physicist,

József Ádám geodesist,

László Szarka (Chair) geophysicist,

Gábor Zelei geophysicist.



Eötvös 100 Opening
Hungarian Academy of Sciences
14.01.2019

Digitally converted
3D anaglyph photo

Fruska Gora, Titel, 1902

Conversion:
Zsolt Regály
Konkoly Observatory





3D photo presentation
14.01.2019



Wreath laying ceremony
Budapest, 2019.04.09.

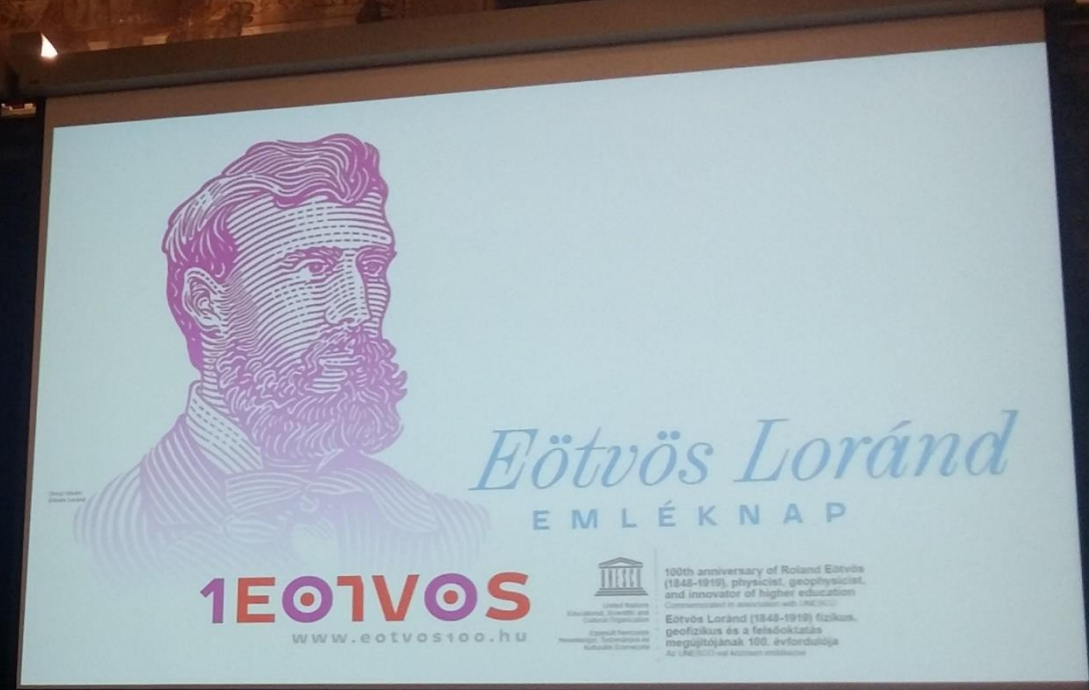
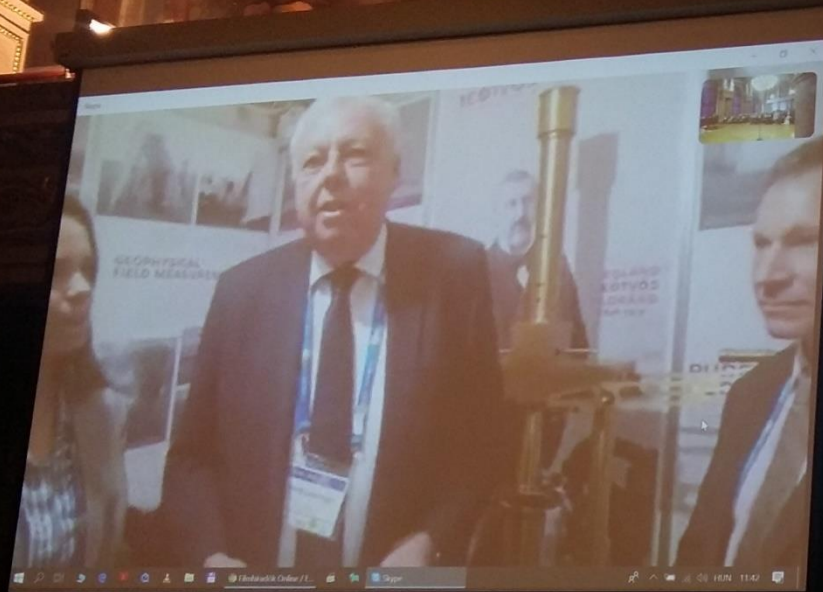


Eötvös 100 Commemorative Day
Budapest, 2019.04.08.



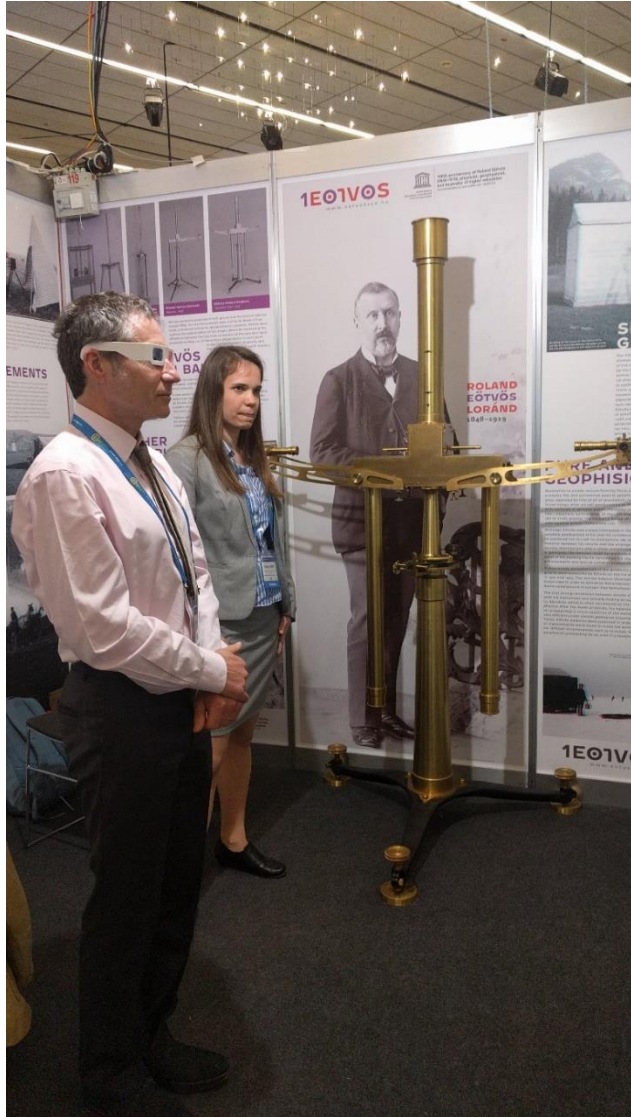
Budapest, 2019.04.09.: thanksgiving mess

Living stream from the Vienna EGU with the EGU and the AE presidents



1EΘTVΘS

Eötvös 100 exhibition at the EGU 2019 in Vienna
(with 3D stereoscopic photos by Eötvös and the „doubled” torsion balance)



Jonathan Bamber
President, EGU



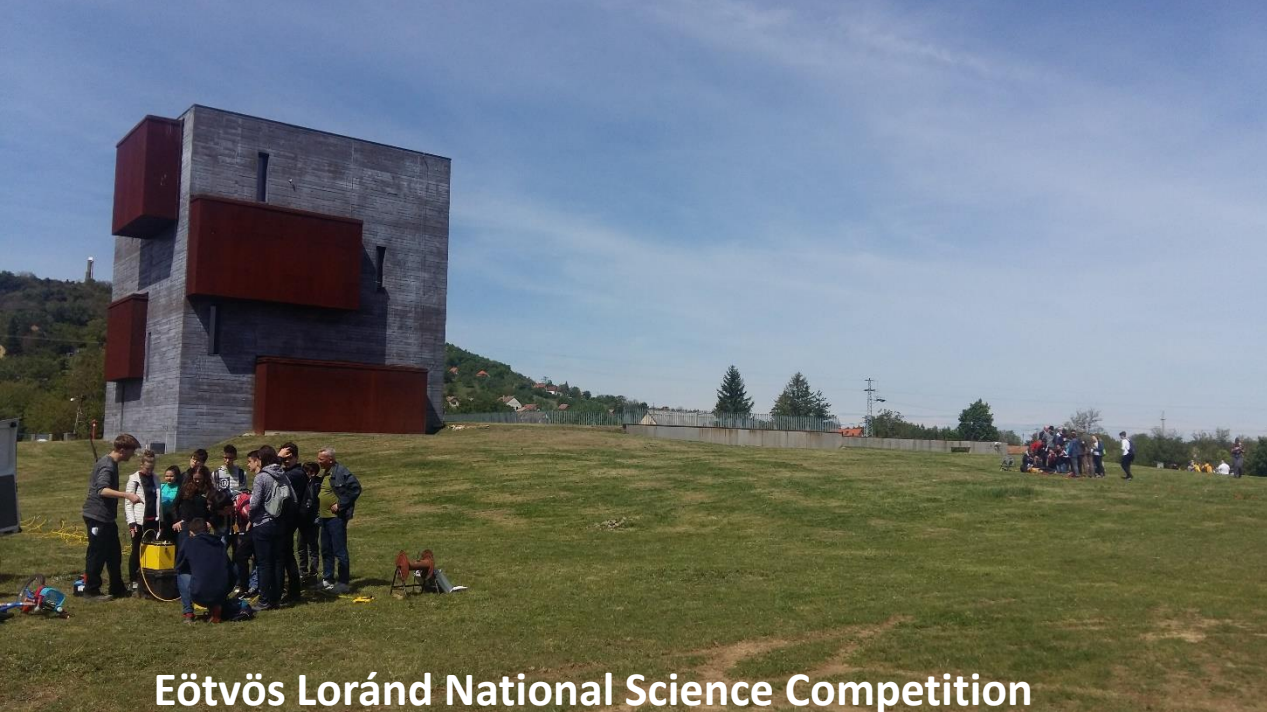
Sierd Cloetingh
President, AE



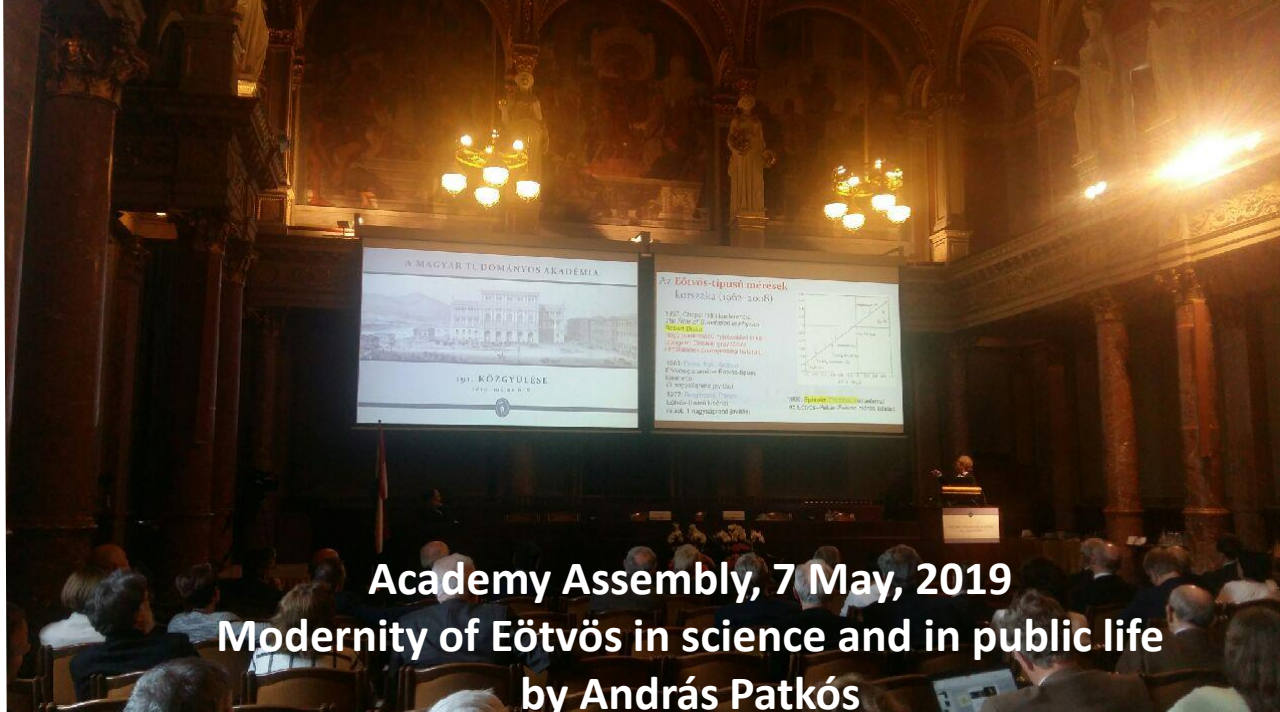
Robin Elisabeth Bell
President, AGU



Alik Ismail-Zadeh
SG, IUGG



**Eötvös Loránd National Science Competition
Final: Ság hill (Celldömölk, 11-12 May, 2019)**



**Academy Assembly, 7 May, 2019
Modernity of Eötvös in science and in public life
by András Patkós**



**Modern theories in gravitation
(Mordehai Milgrom)
13 May, 2019**

IUGG
Montreal,
July 2019



[illegible]

(Sopron, 22.08.2019)



Exhibition of stereographic
óphotos made by Eötvös in
South Tyrol
Toblach/Dobbiaco
09.08.2019



Cent'anni fa moriva Eötvös

L'Ungheria e il Comune di Dobbiaco onorano il Barone

A un secolo dalla scomparsa, l'Ungheria e il Comune di Dobbiaco onorano il Barone Loránd Eötvös, scienziato e alpinista, con una mostra fotografica a ricordo dei suoi soggiorni dolomitici.

Fino alla Prima Guerra Mondiale, Dobbiaco e i vicini borghi di Höhlenstein-Landro e Schluderbach-Carbonin accoglievano d'estate molti villeggianti di spicco, dei quali buona parte apparteneva alle classi sociali più elevate: regnanti, nobili, uomini politici, artisti e scrittori. Tra le personalità di maggior caratura, emerge la figura del Barone magiaro Eötvös

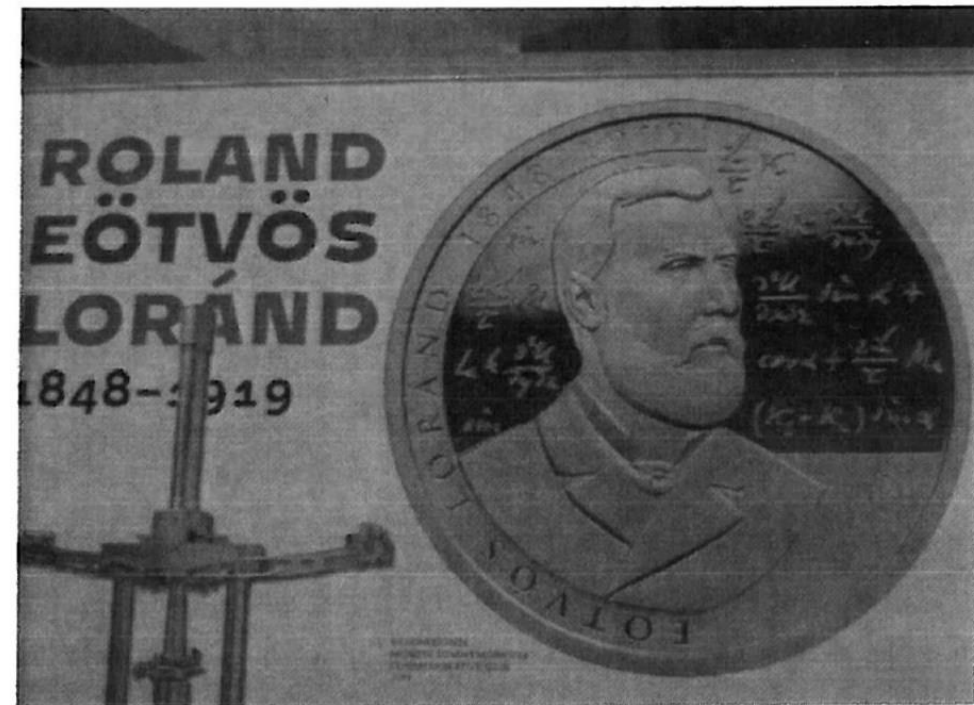
(1848-1919), Ministro della pubblica istruzione, docente di fisica e Rettore dell'Università di Budapest, che dal 1950 è intitolata a lui.

Dal 1875 la famiglia di Eötvös frequentò la Val Pusteria in entrambe le stagioni, fermandosi all'Hotel Ploner di Schluderbach. Lo scienziato amava molto le montagne e fu un provetto alpinista. Prima con la guida Michel Innerkofler di Sesto, poi con quelle ampezzane e dal 1896 con le figlie Rolanda e Ilona (che, arrampicando con Dimai, Verzi e Dibona, raggiunsero il quinto grado di difficoltà) si cimentò in moltissime escursioni e

scalate, distinguendosi in una quindicina di prime, tra le quali, il 19 luglio 1884, quella della Croda da Lago a Cortina.

In coincidenza con il centenario della morte dell'insigne conterraneo, l'Ungheria ha promosso una serie di appuntamenti per ricordarne la vita e le opere.

Il Comune di Dobbiaco si è inserito di buon grado nel quadro delle celebrazioni in onore del Barone e, con l'Accademia ungherese delle scienze, ha aperto presso la Haus Johannes-Galerie in viale San Giovanni 25 una mostra di fotografie scattate da Eötvös nei suoi



La medaglia celebrativa di Eötvös. (Foto I.D.F.)

soggiorni montani. Le immagini, riprodotte in stereoscopia, costituiscono documenti di storia spesso commoventi, e svelano un panorama molto ampio sulle escursioni e le visite del fisico magiaro e dei suoi familiari durante le vacanze

ai confini dell'Impero.

La mostra è stata aperta il 9 agosto al cospetto di una delegazione ungherese e del Presidente del Comitato «Eötvös 100» Laszlo Szarka, e rimarrà aperta fino al 21 settembre.

E.M.



Roland Eötvös bicycle tour from Székesfehérvár to the Dolomites (610 km)
(06.09.2019)



Eötvös 100
(Kiscell Museum,
08.09.2019)



Lake reconstruction
(Eötvös Collegium
09.09.2019)



The Eötvös peak (2837 m, Cadin Dolomites, South Tyrol)
11.09.2019.



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Nyomtatás

4582. Dolomitok-Eötvös emlékhely (GCMISU)

Bázisunk, Dolomiti panzió



Szélesség **N 46° 34,615'**
Hosszúság **E 12° 17,092'**
Magasság: **2620 m**
Megye/ország: **Olaszország**
Térképen: **TuHu** - **OSM** - **GMaps**
Koordináták letöltése GPS-be
Közelí ládák
Közelí pontok

Elhelyezés időpontja: **2019.09.11 13:00**
Megjelenés időpontja: **2019.09.20 20:53**
Utolsó lényeges változás: **2019.09.20 20:53**
Utolsó változás: **2019.09.23 21:28**
Rejtés típusa: **Hagyományos geoláda**
Elrejtők: **ha2**
Felhasználó: **ha2**
Nehézség / Terep: **2.5 / 4.5**
Úthossz a kiindulóponttól: **5100 m**
Megtalálások száma: **0**

Az indulásnál



At the Roland Roland Eötvös plaque
In Heidelberg

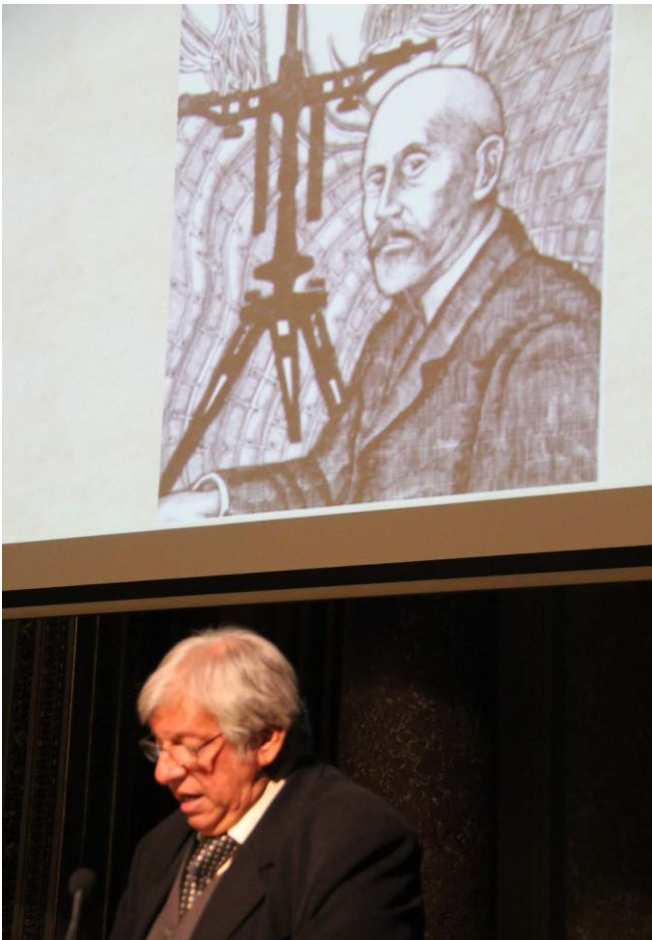
17.09.2019

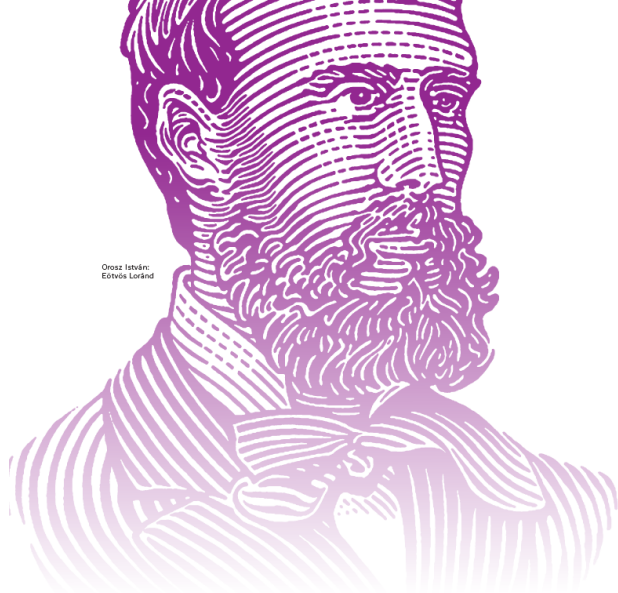


21.09.2019

The Hungarian Heritage Prize

Ceremony at MOM (The Süss Works)





Ország István:
Eötvös Loránd

Invitation

Inauguration of Roland Eötvös Plaque

**Červená studňa, Banská Štiavnica
(Slovakia) 11 a.m., 19 October
(Saturday), 2019**

*Mesto Banská Štiavnica, Geoclub Šobov,
Združenie baníckych spolkov a cechov Slovenska,
Eötvös Loránd Geofizikai Alapítvány, Magyar
Geofizikusok Egyesülete, Magyar Turista
Egyesület, Országos Magyar Bányászati
és Kohászati Egyesület*

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100th anniversary of Roland Eötvös
(1848-1919), physicist, geophysicist,
and innovator of higher education
Commemorated in association with UNESCO

Eötvös-út
„Etveska”



Image © 2019 Maxar Technologies
© 2018 Google

Roland Eötvös

COMMEMORATIVE YEAR
2019

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EÖTVÖS 100 EVENTS IN
BUDAPEST, CONCOMITANT
WITH THE WORLD SCIENCE
FORUM AND THE FEAST
OF THE HUNGARIAN SCIENCE

20 November WEDNESDAY:

**Eötvös 100 Special Session at the
World Science Forum** (in English,
Ceremony Hall, Hungarian Academy of
Sciences, 1051 Bp., Széchenyi tér 9.)

11:00–12:30 “Eötvös 100”: Outcomes of the
Eötvös 100 Commemorative
Year. Moderators: **Kathryn Whaler**,
President of the International Union
of Geodesy and Geophysics, and
Alik Ismail-Zadeh, Secretary of
the International Science Council

11:00–11:10 The Eötvös 100 Commemorative
Year **László Szarka**, Chair of the
Eötvös 100 Coordination Team

11:10–11:30 Stereoscopic photos by Roland
Eötvös and their digital conversion
Zsolt Regály, CSFK Konkoly
Observatory

11:30–11:50 Experiences and results from
re-running the Eötvös experiment
Lajos Völgyesi, BME

11:50–12:00 Discussion

12:00–12:30 Book launch: The Eötvös
experiment in its historical
framework **Gábor Dávid**, Stony
Brook University, and **Jenő Súlyom**,
President of the Eötvös Loránd Physical
Society. Complimentary copies of the
English version will be made available
to participants of the Eötvös 100 Special
Session.

22 November FRIDAY:

**“Eötvös 100”: A Temporary
Exhibition** (ELTE University Library,
1053 Budapest, Ferenciek tere 6.)

13:00–14:00 Opening Ceremony of the
Eötvös 100 Exhibition (in Hungarian)
Open on
22 November: 14:00–18:00,
23 November: 11:00–18:00,
25–29 November: 10:00–18:00

23 November SATURDAY:

**Finals of the “Roland Eötvös
Commemorative Competition”
for high schools** (Ceremony Hall,
Hungarian Academy of Sciences,
1051 Budapest, Széchenyi tér 9.)

10:00–16:00 Invited guests only (in Hungarian)

26 November TUESDAY:

The Roland Eötvös Memorial Album
(MTA Reading Room, 1051 Budapest,
Széchenyi tér 9.)

11:00–12:00 Book Launch: The Roland Eötvös
Memorial Album
(ceremony: in Hungarian)

11:00–11:05 Welcome by **László Szarka**, Chair,
Eötvös 100 Coordination Team

11:05–11:35 Presentation of the album **Gábor
Gyáni** and **András Patkós** co-editors

11:35–11:55 Presentation of the first copies to
László Borhy, Rector of ELTE,
László Lovász, President of MTA,
Miklós Réthelyi, Chair, Hungarian
National Commission for UNESCO

11:55–12:00 Welcome by **András Sándor Kocsis**,
President & CEO of Kossuth Publishing

28 November THURSDAY:

**High School Students at the
Academy: Eötvös 100 Presentations**

10:00–12:00 Programme (in Hungarian)

10:00–10:15 **Gyula Tóth** (BME):
Re-running of the Eötvös
Experiment

10:15–10:30 **Péter Ván** (Wigner FK):
The Fifth Force

10:30–10:45 **Péter Raffai** (ELTE):
Astronomy with Gravity Waves

10:45–11:00 **Armand Abordán** (ME):
The Eötvös Torsion Balance
in Geophysics

11:00–11:15 **Márk Szijártó** (ELTE):
Research in Capillarity

11:15–11:30 **Veronika Barta**, **Csenge Czanik**
(CSFK): Eötvös 100 at International
Meetings in 2019

11:30–12:00 Discussion

Permanent EÖTVÖS 100 EXHIBITION:

**MBFSZ Roland Eötvös Memorial
Collection** (1145 Budapest, Columbus
utca 17–23.)

Open from Monday to Friday:
10:00–16:00

Request for professional guidance:
kovacs.peter@mbfsz.gov.hu

Baron Eötvös' truths on gravitational force and surface tension will remain in a thousand years as true and valuable they are today, even when our actual concepts for the gravity and for the smallest parts of the matter would happen to be eliminated. ”

Sándor Mikola, 1929

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Az UNESCO-val közösen emlékezve

„So, finally, we must rest assured that science does not give the true explanation of natural phenomena, but only leads to the border where the elusive begins.”

Eötvös, 1877