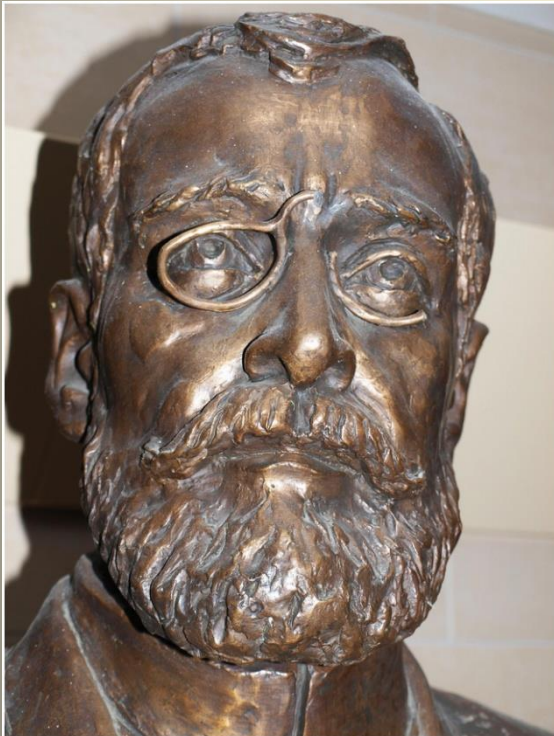


**"... because most of the things, I can consider now as my property, I have learned in Ó-Gyalla\*"**

**Years spent by Radó Kövesligethy at Konkoly observatory**

Ing. Pavol Mikulík, PhD.



**\* Currently Hurbanovo, Slovak Republic.  
In this presentation, the contemporary 19<sup>th</sup> century Hungarian  
Ó-Gyalla (Stará Ďala) form will be used.**

# Childhood

## Years in Verona

- Born 1<sup>st</sup> September 1862 out of wedlock
- Mother Josephine Renz, from Bavarian family of farmers
- Father József Konek, Hungarian military officer
- Christened Rudolph, later changed to Radó
- At age of 4, his father leaves the family

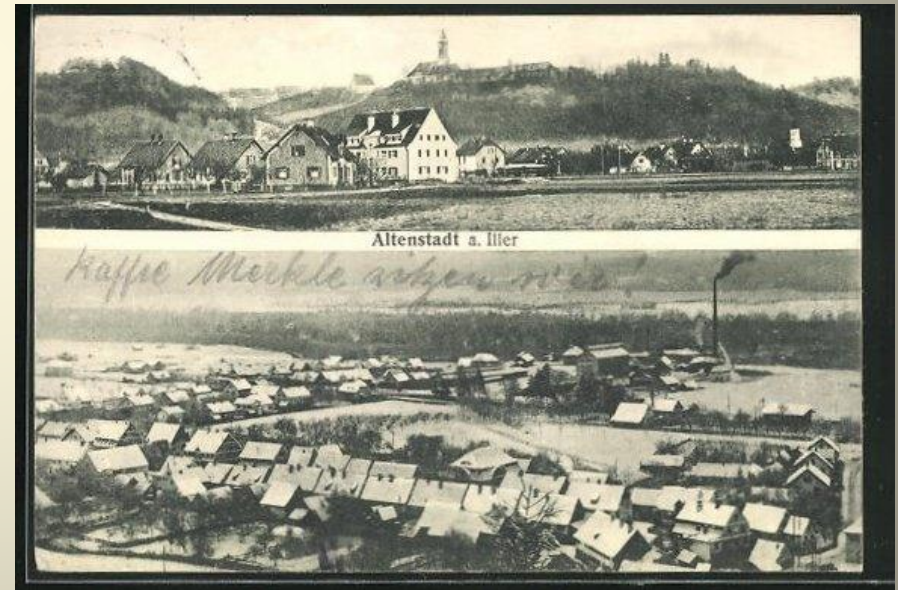


Verona in 19th. Century

Credit: Wikipedia

## Years in Altenstadt

- After her life partner leaves, Josephine returns to her native Altenstadt in Bavaria
- Supportive family background in Altenstadt
- At his age of 11, Josephine marries with a Hungarian lawyer, Károly Kövesligethy
  - ❖ The family moves to Hungary
  - ❖ The husband adopts Rudolph
  - ❖ Rudolph gets the family name of his stepfather



Altenstadt in 19th. Century on Postcard

Credit: Wikipedia

# At the Grammar School



The Main Royal Catholic Grammar School in Bratislava (Pozsonyi Királyi Katholikus Főgymnázium) in the building of former Clarisse monastery

Credit: Wikipedia



**Károly Wiedermann**  
Director of the Grammar School

Credit: Wikipedia

➤ In 1873 starts studying on the “Main Catholic Grammar School” in Bratislava (Pozsony)

- ❖ One of the most prominent Grammar Schools in contemporary Hungary
- ❖ That time residing at the building of former Clarisse Monastery
- ❖ His interest in astronomy begins in 2nd. grade
- ❖ Significant results in astronomy in 6th. grade
- ❖ Strong support from his teachers
- ❖ In 7th grade during Summer Vacation visits Ó-Gyalla

➤ Most influential professors:

- ❖ Dezső Fridrik
  - Teaching Physics, initiated his first visit in Ó-Gyalla
- ❖ Károly Wiedermann
  - Director of the Grammar School
- ❖ Frigyes Dohnányi
  - Teaching Mathematics
  - His son became a famous Hungarian composer



**Frigyes Dohnányi**  
With his family



Performance on Cello with F. Liszt

Credit: Wikipedia

# First visit at Konkoly Observatory in Ó-Gyalla

- Kövesligethy first visited the Konkoly Observatory with his parents during summer vacation in 1880
  - ❖ From the initiative and with support of his teachers (Fridrik, Wiedermann)
- He immediately joins the scientific work at the observatory
- Since that time, he spends all his summer and spring vacations in Ó-Gyalla
- The relation between Konkoly and Kövesligethy can be in notions considered as the relation of father and son



**The Konkoly Observatory around 1910**

Credit: Meteor, July 2016 [6]



**The Konkoly Observatory in 19th Century**

Credit: Wikipedia

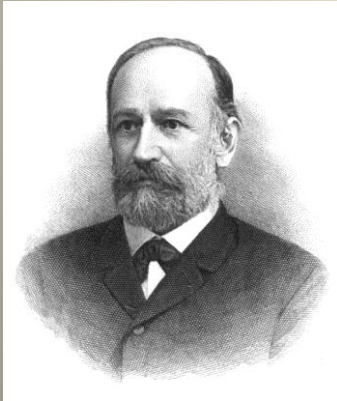
# Years at the Vienna University



Die neue Universität in Wien.

**The Vienna University in 19th. Century**

Credit: Wikipedia



**Josef Stefan**

**Author of Stefan-Boltzmann law  
Kövesligethy's Professor of Physics**

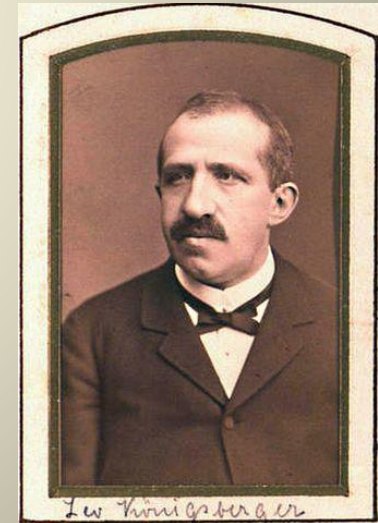
Credit: Wikipedia



**Theodor von Oppolzer**

**Prominent Austrian astronomer  
Kövesligethy's Professor of Classical Astronomy**

Credit: Wikipedia



**Leo Königsberger**

**Kövesligethy's Professor of Mathematics**

Credit: Wikipedia

# The Vienna University Observatory



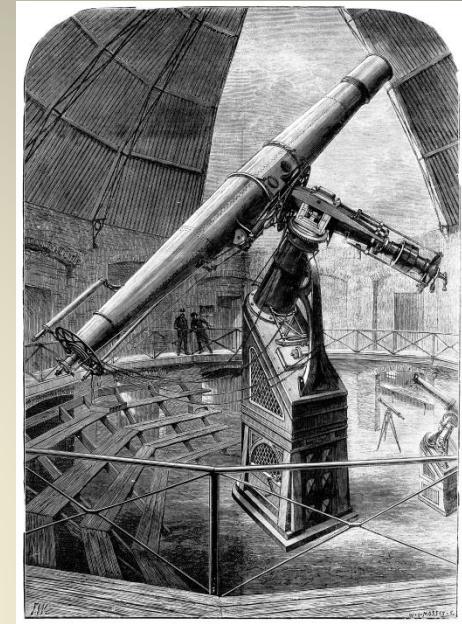
**Edmund Weiss**

Director of the Vienna University Observatory  
Kövesligethy's professor of Astrophysics  
Credit: Wikipedia



**Hermann Vogel**

Director of Potsdam Astronomical Institute  
Later colleague and friend of Kövesligethy  
In 1883 working also in Vienna  
Credit: Wikipedia



**The famous Grubb Refractor**

The main instrument of Vienna University Observatory, Kövesligethy had also observed with it  
Credit: Wikipedia



**Building of the Vienna University Observatory**  
On contemporary postcard

Credit: Wikipedia



**During the visit of the Emperor Franz Josef in 1883  
Kövesligethy had the honor to introduce him  
the new spectral analyser, its significance and methods of using**  
Credit: Wikipedia

# Starting as professional astronomer at Konkoly observatory

- The focus of scientific activity was on spectral measurements
- Konkoly joined the project of Hermann Vogel of creating a star catalogue according to spectral classes [1], [2]
  - ❖ Majority of measurements were provided by Kövesligethy
  - ❖ Vogel's catalogue was extended by stars from 0 to -15 degrees of declination, up to 7,5 mag. (2,022 stars added)
  - ❖ This catalogue had great importance at that time, even if it was later replaced by the Henry Draper Catalogue



**The young Radó Kövesligethy**

Credit: Wikipedia



**Hermann Kobold**

Predecessor of Kövesligethy at the position  
of Observer in the Konkoly observatory

Credit: Wikipedia



**Radó Kövesligethy (not confirmed)  
at refractor**

The only known photo without beard

Credit: Wikipedia





# The Spectral Theory

- The theory was derived in accordance with commonly accepted assumptions of contemporary scientific community
  - ❖ Ether Theory
  - ❖ Principle of Equipartition
  - ❖ Atoms were considered as elementary particles without inner structure
- Astonishing approximation of the Planck Spectral Function (15 years earlier)
- Kövesligethy derived also the Wien Displacement Law (7 years earlier than Wien)

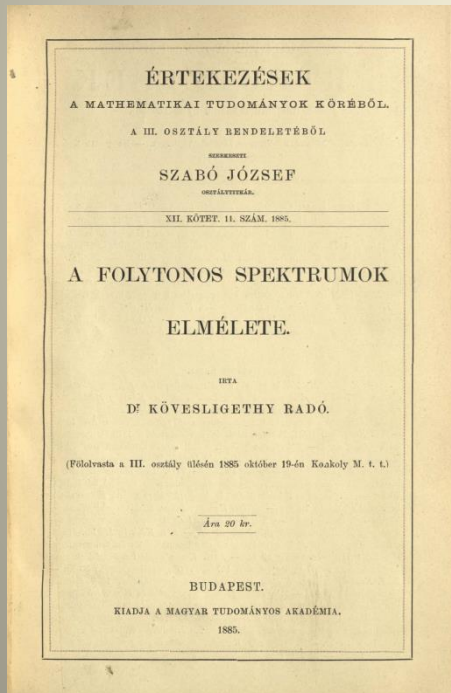
A (27) egyenlet még egy igen jelentékeny, s alkalmazásai-ban fontos átváltoztatást enged meg. Ha csak a spektrum egyes színeit akarjuk tanulmányozni, akkor a  $L_0$  állandó helyébe az izzó test összes energiáját is behozhatjuk; (27) és (41)-ből következik ugyanis:

$$L = \Lambda \frac{4\mu}{\pi} \cdot \frac{\lambda^2}{(\lambda^2 + \mu^2)^2} \dots \dots \dots (53)$$

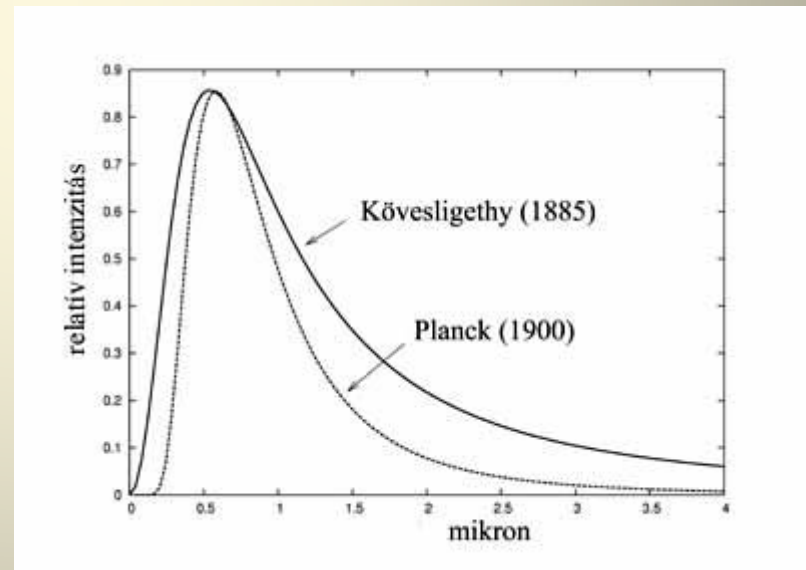
A Draper \*) által kísérleti úton talált, s később a Kirchhoff-féle tétel által elméletileg is bebizonyított törvény szerint minden test egy és ugyanazon hőmérsékletnél kezd vörös sugarakat, egyáltalában egy bizonyos törékenységű sugarat kibocsátani. Az (53) egyenletre alkalmazva ezen tételt, lesz:

$$\frac{\Lambda\mu}{(\lambda^2 + \mu^2)^2} = \text{konst.} \dots \dots \dots (54)$$

The Kövesligethy formula for continuous spectrum of absolute black body radiation [4]



The Theory of Continuous Spectra  
Study published in 1885 [4]



Comparison of Kövesligethy and Planck spectral function  
Cited from Balázs Lajos, [3]

# Further achievements of Kövesligethy in astronomy during his period at Ó-Gyalla

## ➤ Further creative utilisation of spectral measurements

- ❖ Measuring radial velocity of stars
- ❖ Consequent statistical determination of proper motion of the Sun
- ❖ Proposed a method of distinguishing intrinsic and extrinsic variables – successfully applied by Hermann Vogel in Potsdam

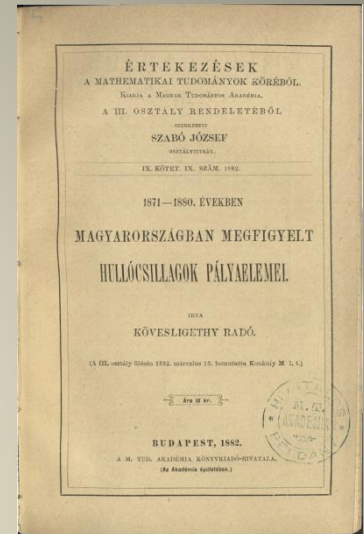
## ➤ Meteor studies

- ❖ Calculating radiants of meteor showers and their movement
- ❖ Assigning particular meteor showers to known short period comets

## ➤ Using of Astrophotography

- ❖ Owing to his friend Jenő Gotthard he mastered the technique of Astrophotography
- ❖ From Gotthard's revolutionary photo of central star of Ring Nebula in Lyra drew a conclusion of large portion of UV radiation of the star and its extremely high temperature
- ❖ Within "Carte du Ciel" program proposed a parallel photographic mapping of skies in both Full Spectrum and IR

## ➤ Sun-spot observations



Trajectory Elements of Falling Stars [5]



The famous photographic record of Lyra Ring Nebula (M57) with the Central Star from 1895 by Jenő Gotthard

Credit: Wikipedia

# Towards Geophysics and Seismology

## Milestones of Kövesligethy's carrier after leaving Ó-Gyalla

**1887 – Employed at the Department of Experimental Physics  
at the Budapest University of Sciences**

**1890 – Issues the book "*Grundzüge einer teoretischen Spektralanalyse*"  
(Fundamentals of Theoretical Spectral Analysis)**

**1894 – Corresponding Member of the Hungarian Academy of Sciences**

**1899 – Vice-president of Ó-Gyalla Observatory after it becomes Hungarian state property**

**1904 – Professor of Cosmography at the Budapest University of Sciences**

**1905 – Co-founder and General Secretary of International Seismological Association (ISA)  
until its dissolution in 1922**

**1906 – Establishes the Seismological Observatory at the Budapest University of Sciences**

**1911 – Establishes the Cosmographical Institute at the Budapest University of Sciences**

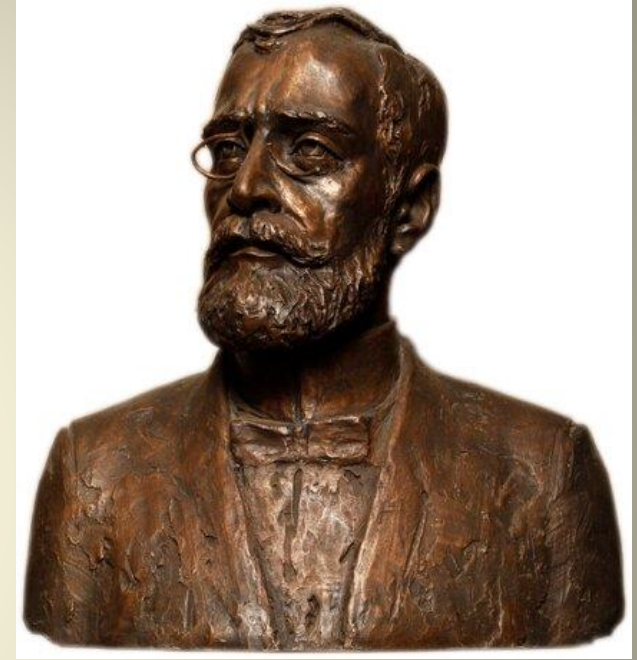
**1909 – Fellow of the Hungarian Academy of Sciences**



Credit: Wikipedia

# Legacy of Radó Kövesligethy

- **Achieved significant international recognition in 2 separate scientific disciplines:**
  - ❖ **Astrophysics**
  - ❖ **Geophysics and Seismology**
- **Strong organisational skills and public activity**
  - ❖ **Protagonist of many scientific institutions**
  - ❖ **Protagonist of many research programs**
  - ❖ **Excellent language skills**
- **Active also in popularisation of science**
  - ❖ **Protagonist of Urania Scientific Theatre in Budapest**
  - ❖ **His publications for wider audience are attractive and rigorous at the same time**
  - ❖ **Wrote a drama, "The Harmony of the Spheres" about history of astronomy**
- **Strong social sensitivity and great portion of humor**



## References:

- [1] L. Szabados ed.: Kövesligethy Radó és az asztrofizika kezdetei Magyarországon, Budapest Konkoly Observatory, 2011
- [2] L. Bartha, K. Péntek, M. Sragner: Kövesligethy Radó a csillagász és geofizikus – emlékkötet, Gotthard Jenő cs. Egyesület, Szombathely, 2019
- [3] L. Balázs: Kövesligethy spektroszkópai vizsgálatai, in Magyar Tudomány, Journal of Hungarian Academy of Sciences 2013/I.
- [4] R. Kövesligethy: A folytonos spektrumok elmélete, Budapest, 1885
- [5] R. Kövesligethy: Magyarországon megfigyelt hullócsillagok pályaelemei, Budapest, 1882
- [6] L. Bartha: Emlékezés Ógyallán, in: Meteor, Journal of Hungarian Astronomical Association, July 2016, pp. 114 - 117

**Thank you for your kind attention**