

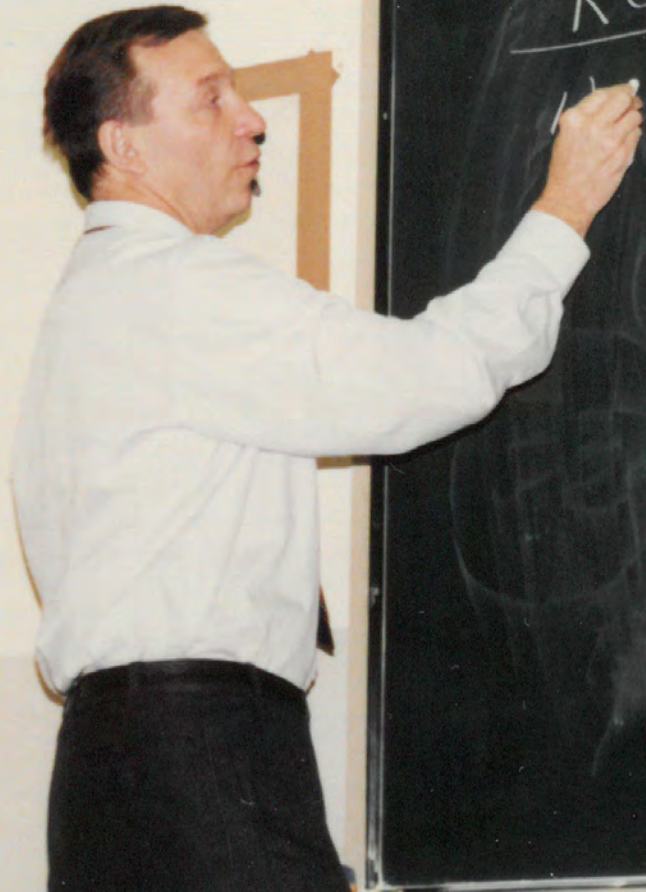


Jiří Bičák
teacher and mentor





Relativity in 60 m



Jan Slavík



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On Motion of the Magellanic Clouds
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Introduction
It is usually assumed that for the motion in the Milky Way the influence of neighbouring galaxies is negligible. We demonstrate that it is not the case and the role of the external gravitation is crucial even on such relatively small scales.

Magellanic clouds
Large Magellanic Cloud (LMC) and Small Magellanic Cloud (SMC) are dwarf galaxies in the vicinity of Milky Way. Their distance from MW centre is 17 kpc (LMC) and 70 kpc (SMC). We assume both LMC and SMC to be test particles moving independently in the MW field, their mass is substantially smaller than those of the MW and their distance from the Galactic disc is substantially larger than its extension. The motion of the LMC and SMC system can be then quite precisely very precisely observed, if their recent kinematics (Walter et al., 2008). The Newtonian approximation can be used since the GR effects are negligible (Mach-Schulz 2012).

Milky Way gravitational field
The gravitational field of the Milky Way is generated in the standard way by the Galactic disc:

$$F_{\text{disc}} = -\frac{GM_{\text{disc}}}{r^2} \hat{r} \quad (1)$$
$$\sqrt{v^2} = v = \sqrt{v_r^2 + v_\phi^2} \quad (2)$$

the Galactic bulge:

$$F_{\text{bulge}} = -\frac{GM_{\text{bulge}}}{r^2} \hat{r} \quad (3)$$

and the LMC halo:

$$F_{\text{halo}} = -\frac{GM_{\text{halo}}}{r^2} \hat{r} \quad (4)$$

where $M_{\text{disc}} = 1.5 \times 10^{11} M_\odot$, $M_{\text{bulge}} = 1.5 \times 10^{10} M_\odot$, $M_{\text{halo}} = 1.5 \times 10^{10} M_\odot$, $r = 17 \text{ kpc}$ and $r = 70 \text{ kpc}$ for LMC and SMC, respectively. Since $v_{\text{disc}} \approx 220 \text{ km s}^{-1}$, the hyperbolic halo model replaces the halo

Initial conditions
The LMC and SMC are born in galaxies

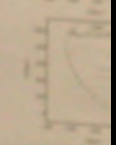
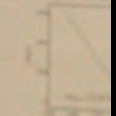
$$\dot{r} = -v_r \quad (5)$$
$$\dot{\phi} = v_\phi \quad (6)$$

Then $v_r = -10 \text{ km s}^{-1}$ and $v_\phi = 40 \text{ km s}^{-1}$

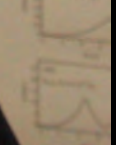
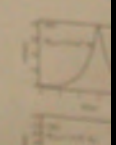
Constraints on λ

- We compare our results with the existing data
- $\lambda = 1 \pm 0.1$
- Since the age of the LMC is estimated to be $\approx 10 \text{ Gyr}$
- The age of the SMC is estimated to be $\approx 10 \text{ Gyr}$

Influence of λ on the motion



The influence of λ on the motion of the Magellanic clouds is shown in the following graphs.



Zdeněk Stuchlík



Jiří Basler

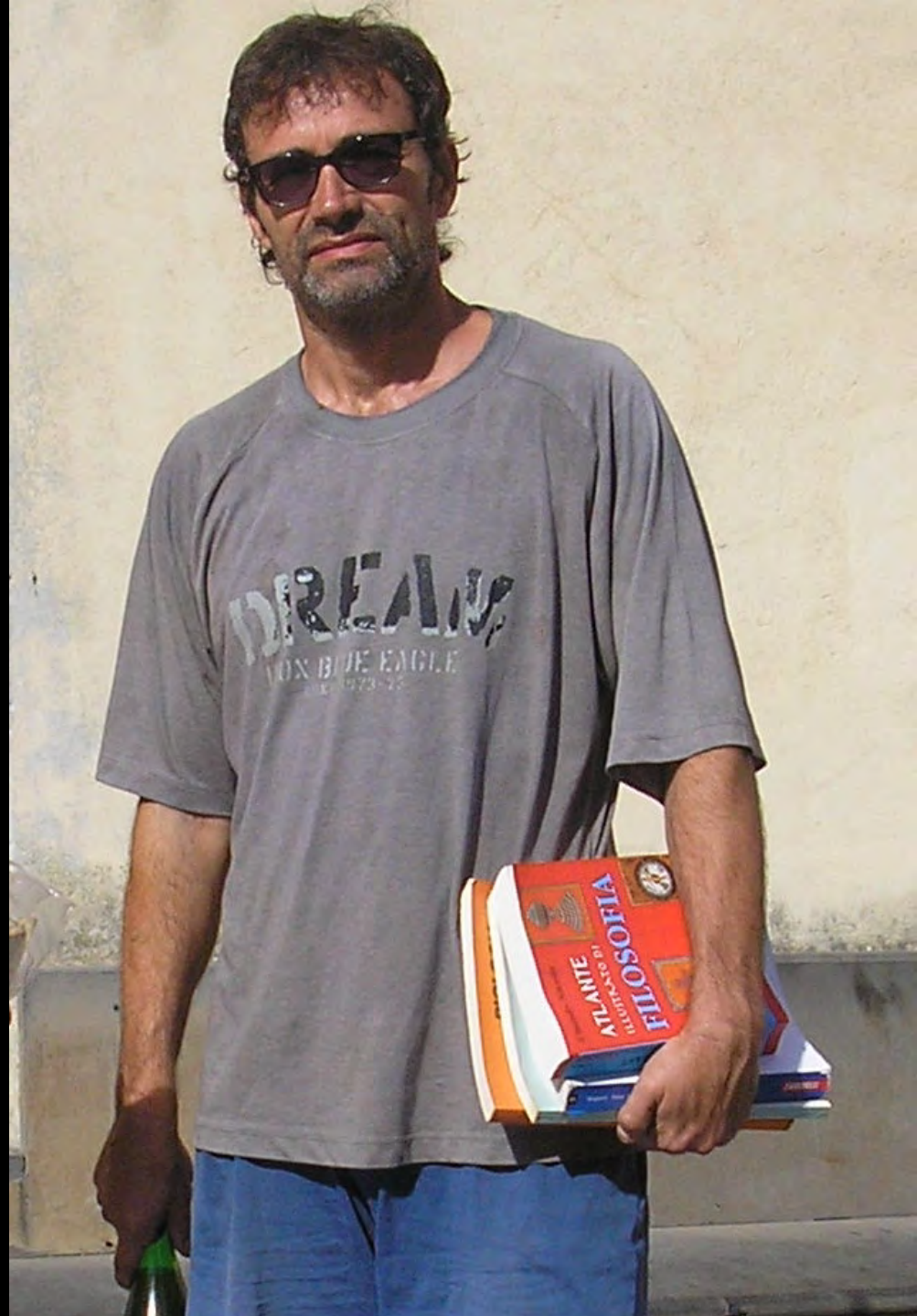
Vladimír Karas





Ralf Muschall

Oldřich Semerák



Ondřej Šipr





Jiří Podolský

Tomáš Kopf





Pavel Krtouš



Eduard Gajdoš

Tomáš Ledvinka





Alena Pravdová

Vojtěch Pravda



Tomáš Doležel



Roman Sagner





Alexandr Malijevský

Stanislav Hledík

that is reduced to the well known Lane-Emden
logical term disappears.

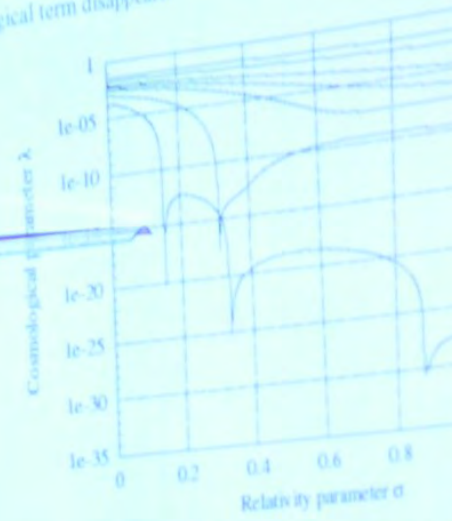


Figure 1: Dependence of λ_{\max} on α for selected values
parameter α .



Martin Žofka

Eliška Lehečková





David Kofroň



Martin Scholtz

David Kubizňák





Martin Bohata

Norman Gürlebeck





Marián Pilc



Filip Hejda



Josef Schmidt



Jakub Haláček

Morteza Kerachian





Mak Pavičevič



Bára Bezděková





Jiří Bičák
scientist and colleague



Ten, kdo nám dovedl ukázati některou novou linii, některou netušenou perspektivu z krásy věcí a světa, je naším dobrodincem, jediným a nezapomenutelným. Zdá se nám, jako by nám patřil před svým narozením a celou věčností se k nám blížil a v tomto životě nás nalezl, aby nám řekl, co nám měl říci. Po celý život jsme mu vděčni dle zákona lásky, která nedovede zapomenouti než jen to, co sama rozdala.

Otokar Březina (1868-1929), Hudba pramenů — Krása světa

He who was able to reveal to us a new line, an unforeseen perspective within the beauty of the things and of the world, is our benefactor, unique and unforgettable. It seems to us as if he belonged to us before his birth and was approaching us throughout all eternity, to find us in this life and tell us what he had to tell. We are grateful to him all our lives according to the law of love which is able to forget nothing but that which she herself gave to others.

Katedra teoretické fyziky MFF UK na exkursi (výletě)
v r. 1962-3 (?)

Zleva: Karel Kuchař, Oda Bílek, Jan Obdržálek,
(2-mořá Jelinek), Milan Marvan, Karel Rohlena,
Jiří Langer (poupalmu), Václav Vítch, Ota Horáková,
Ván Větrný, Jiří Dvořák, Blána Bastecká,
Alena Mesová, Čestmír Hutník

fotil Jiří Dvořák

(zapsal 4.1.2004 J.Dv.)





L. E. M. L. Friedman

in conference with Ben

1946



J. A. Wheeler

E. Schmutzer

JB

J. Langer

JB



M. Rees



V. N. Ruděnko

K. Thorne

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H. Stephani

JB

J. Langer

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M. Šolc A. Mészáros D. Vokrouhlický O. Semerák
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J. Langer

Z. Stuchlík

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D. Lynden-Bell

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P. Hájíček JB

J. A. Wheeler

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G. Schäfer







K. Thorne

JB



Na snemu Akademie věd 16. 12. 2014 s prof. H. Kellnerovou



UNIVERSITAS CAROLINA





R. Wald

JB



G. Gibbons



A. Ashtekar



H. Nicolai

T. Damour

JB

JB

D. Lynden-Bell



J. Halacek



G. Schäfer

JB



JB

J. Ehlers



J. Halacek

P. Krtouš

H. Reall

J. Podolský

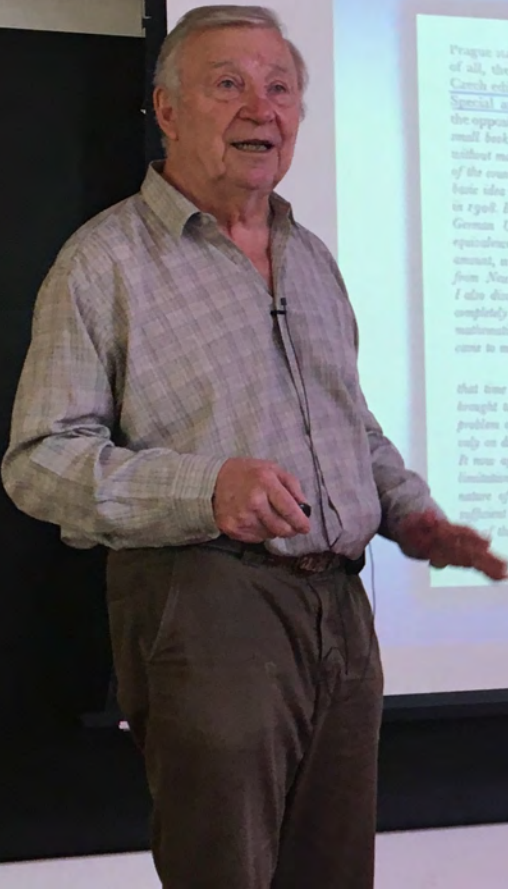
JB



About the special and general theory of relativity in plain terms (Czech translation)

Prague stage of his journey to the general theory of relativity? First of all, there is a previous document — Einstein's foreword to the Czech edition of 1923 of his famous little popular book "About the Special and General Theory of Relativity in Plain Terms" (see the opposite page for the original German text): "I am pleased that the small book, in which the main ideas of the theory of relativity are explained without mathematical elaboration, should now appear in the native language of the country in which I found the necessary concentration for developing the basic idea of the general theory of relativity which I had already conceived in 1907. In the quiet rooms of the Institute of Theoretical Physics of Prague's German University in Vinohrady Street, I discovered that the principle of equivalence implies the deflection of light rays near the Sun by an observable amount, without at that time knowing that a similar result had been deduced from Newton's mechanics and his corpuscular theory of light. In Prague I also discovered the shift of spectral lines towards the red which is not yet completely confirmed. However, the decisive idea of the analogy between the mathematical formulation of the theory and the Gaussian theory of surfaces came to me only in 1912 after my return to Zurich, without being aware of that time of the work of Riemann, Buse, and Leo-Civita. This was first brought to my attention by my friend Grossmann when I posed to him the problem of looking for generally covariant tensors whose components depend only on derivatives of the coefficients of the quadratic fundamental invariant. It now appears that it is already possible to evaluate the achievements and limitations of the whole theory. It gives a deep knowledge of the physical nature of space, time, matter and gravity; however, it does not provide sufficient means for solving the problems of quanta and of the atomic constitution of the elementary electric units of which matter is composed."

Einstein's foreword to the Czech edition of 1923 of his famous little popular book "About the Special and General Theory of Relativity in Plain Terms"







Jiří Bičák, † 26. 1. 2024