

## PREFACE

The Eleventh Marcel Grossmann Meeting on General Relativity (MG11) took place during July 23–29, 2006 on the Campus of the Freie Universität Berlin, an attractive location for both practical and historical reasons. It is situated in the park-like district of Berlin-Dahlem, where many famous German researchers of the early 20th century lived and worked, among them Planck and Einstein (Fig. 1). The conference site lies close to the former Kaiser-Wilhelm-Institute of Physics where Hahn, Meitner, and Strassmann discovered the fission of uranium in 1938 (Fig. 2).

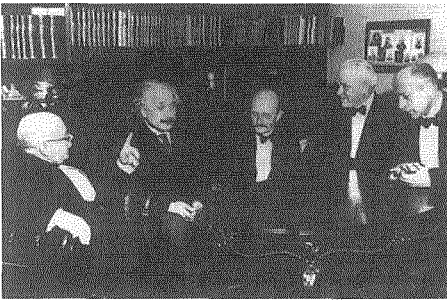


Fig. 1

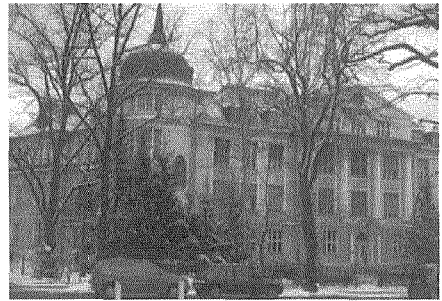


Fig. 2

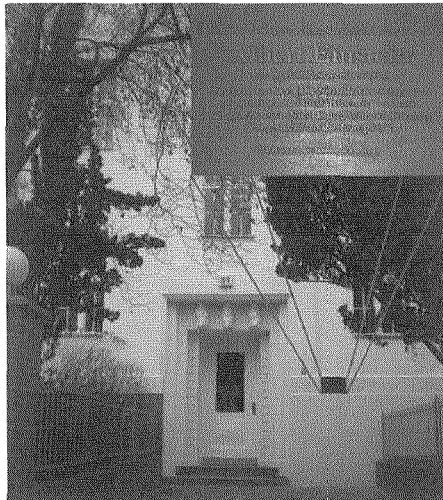


Fig. 3

Otto Hahn's house is just around the corner. So is Einstein's apartment in Ehrenbergstrasse 33 where he lived after moving from Zurich in 1914 (Fig. 3, with zoomed bronze memorial plate at the entrance). Around 800 participants and accompany-

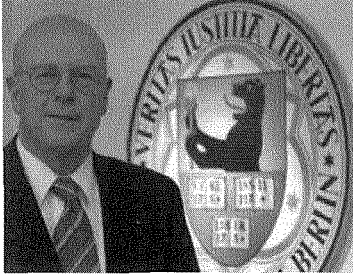


Fig. 4

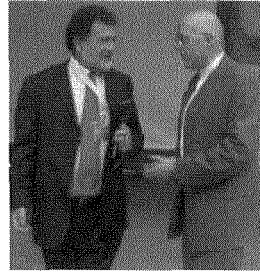
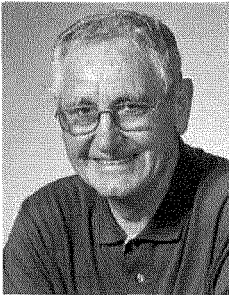


Fig. 5

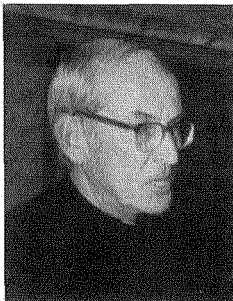
ing persons were present during a week of exceptionally warm summer weather in Berlin. The meeting began with the Marcel Grossmann Awards ceremony on July 23. The institutional award went to Freie Universitt (FU) Berlin (Fig. 4) “for the successful endeavor of re-establishing — in the spirit of the Humboldt tradition — freedom of thinking and teaching within a democratic society in a rapidly evolving cosmos”. Remo Ruffini handed the award to Dieter Lenzen, president of the FU Berlin (Figs. 4 and 5).

Three individual awards were presented to Roy Kerr “for his fundamental contribution to Einstein’s theory of general relativity: The gravitational field of a spinning mass as an example of algebraically special metrics” .

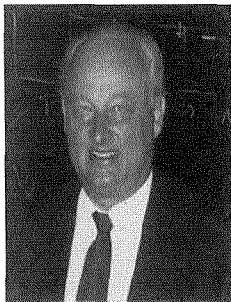
Three individual awards were presented to



Roy Kerr “for his fundamental contribution to Einstein’s theory of general relativity: The gravitational field of a spinning mass as an example of algebraically special metrics” .



George Coyne “for his committed support for the international development of relativistic astrophysics and for his dedication to fostering an enlightened relationship between science and religion” .



Joachim Trümper “for his outstanding scientific contributions to the physics of compact astrophysical objects and for the leading successful ROSAT mission which discovered more than 200,000 galactic and extragalactic X-ray sources: a major step in the observational capabilities of X-ray astronomy and in the knowledge of our universe”.

Each laureate received a silver casting of the TEST sculpture by the artist A. Pierelli. The original casting was presented on the first occasion of the Marcel Grossmann Award to His Holiness Pope John Paul II.

After the prize ceremony the plenary program started with lectures by:

**Thibault Damour** (IHÉS, Bures-sur-Yvette) “Cosmology and string theory”

**Sasha Polyakov** (Princeton University) “The structure beyond spacetime”

**Hermann Nicolai** (Albert-Einstein-Inst. Potsdam) “Hidden symmetries and cosmological singularities”

They were continued each morning from Tuesday to Saturday with the following speakers:

**Claes Uggla** (Karlstaads University) “The nature of generic cosmological singularities”

**Eva Silverstein** (Stanford University) “Cosmological singularities in string theory”

**Igor Klebanov** (Princeton University) “Gauge theories, strings and cosmology”

**Joe Polchinski** (UC Santa Barbara) “Cosmic superstrings”

**Abhay Ashtekar** (Pennsylvania State University) “Loop quantum gravity”

**Dieter Luest** (Humboldt Univ., Berlin) “String theory and the standard model of particle physics”

**Karsten Danzmann** (Univ. Hannover) “LISA”

**Marie Anne Bizouard** (Univ. Paris XI) “VIRGO”

**David Shoemaker** (MIT) “LIGO: Status of instruments and observations”

**Alessandra Buonanno** (Univ. of Maryland) “Analytical approach to coalescing binary black holes”

**Francois Mignard** (Observatoire Côte d’Azur) “Relativistic effects from HIPPARCOS and GAIA missions”

**Michael Kramer** (Univ. of Manchester) “Binary pulsars and general relativistic effects”

**Josh Grindlay** (Harvard Univ.) “Globular clusters and millisecond pulsars”

- Richard Mushotzky** (NASA Goddard SFC) “Intermediate mass black holes and X-ray sources”
- Rashid Sunyaev** (MPA Garching) “The sky in the hard x-ray spectrum”
- Reinhard Genzel** (MPE Garching) “The black hole in our galactic center”
- George Djorgovski** (CALTECH), “The origins of massive black holes and quasars at high redshifts”
- Remo Ruffini** (ICRA, Roma) “Gamma ray bursts”
- Francis Halzen** (University of Wisconsin-Madison) “ICE CUBE”
- Peter Biermann** (MPI for Radioastronomy, Bonn) “Sterile neutrinos in astrophysics and cosmology”
- Volker Springel** (MPI for Astrophysics Garching) “Simulations of the formation, evolution and clustering of galaxies and quasars”
- Paolo De Bernardis** (Univ. Roma La Sapienza) “CMB science from Boomerang to PLANCK”
- David Spergel** (Princeton Center for Theoretical Physics) “WMAP and its cosmological implications”
- Ethan J. Schreier** (AUI, Washington, DC) “ALMA”
- John Mester** (Stanford University) “Equivalence principle from space”
- Francis Everitt** (Stanford University) “The NASA Gravity Probe B Mission: technical report”
- Guy Monnet** (Europ. South. Observatory, Garching) “Science and technology of the European ELT”
- Michael Garcia** (Harvard-Smithsonian Ctr. for Astroph.) “Science from Chandra to Constellation-X”
- Nicholas White** (HEASARC) “Beyond Einstein: from the big bang to black holes”
- Theodor Haensch** (Ludwig-Maximilian Univ. München) “Precise clocks”
- Juergen Renn** (MPI for the History of Science, Berlin) “The genesis of general relativity”

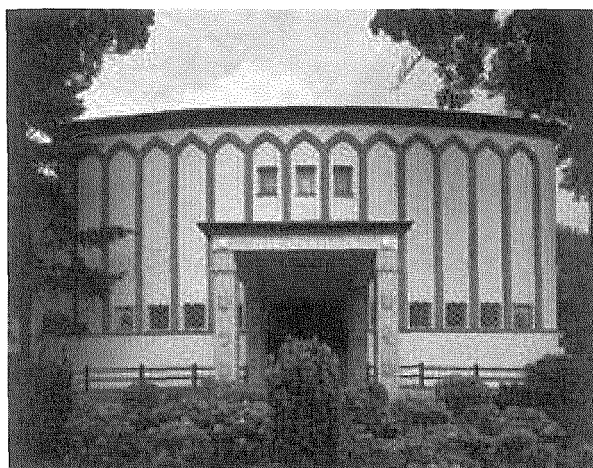
On Monday, Tuesday, Thursday, and Friday, public lectures were presented by

- Hanns Ruder** (University Tübingen) “Visualizations of relativistic effects”
- Günter Hasinger** (MPE Garching) “The fate of the universe — new clues from cosmology”
- Bruno Leibundgut** (Eur. Southern. Obs., Garching) “Das neue Weltbild der Kosmologie — Was ist Dunkle Energie?”
- Christian Spiering** (DESY Zeuthen) “Neutrinoastronomie — ein neues Fenster zum Kosmos”

These lectures were well attended by Berlin citizens and conference participants and found broad resonance in the media. Parallel sessions were held on the afternoons in 20 lecture halls. Some 850 scientific papers were presented during 82 parallel sessions over four afternoons. A typical setting in front of one of the lecture halls is shown below.



Many speakers at MG11 were accommodated in the famous Harnack House, a place where much of the “Dahlem Legend” happened. The house was built during the Weimar republic by the theologian Adolf von Harnack, the first president of the Kaiser-Wilhelm Society. Many German Nobel Prize winners and their students met here for social interaction and academic discussion. Here they held lectures and colloquia, took lunch together, read the new international press, drank coffee in the garden, engaged in sports, and played music. The list of former guests and lecturers reads like a “Who’s Who of Science”: Albert Einstein, Peter Debye, Werner Heisenberg, Fritz Haber, Adolf Butenandt, Otto Hahn, Lise Meitner, Otto Meyerhof, Max Planck, Max von Laue and Otto Warburg. One Nobel Prize winner, the biologist Hans Fischer, even received the news of his award during his stay at the Harnack



House. Also great non-scientists stayed at this house, for instance Ricarda Huch, the Swiss art historian Heinrich Wölfflin, and the Indian philosopher Rabindranath Tagore. In 1935, in direct opposition to the government, Max Planck led an impressive commemoration of Fritz Haber here. The Kaiser-Wilhelm Institutes were later re-organized and renamed as the Max Planck Institutes.

During MG11, a big beer tent was set up in the courtyard of the physics department in the style of the famous Munich Oktoberfest, which was well frequented by all participants since its informal atmosphere was very beneficial for social interactions and the exchange of ideas.

A video stream exchange was set up with the Einstein Institute in Potsdam so that its members were able to follow the Marcel Grossmann lectures and the participants in Berlin could listen to lectures at the Einstein Institute if desired.

The opulent MG11 conference banquet dinner was held at the Ritz Carlton Hotel next to Potsdamer Platz. A Prussian 19th century type brass orchestra was there to play music from the emperor's time.



On July 29 Remo Ruffini closed the meeting thanking all the speakers and participants and sponsoring institutions.

These three volumes represent the proceedings of the meeting. The first volume contains articles by many of the plenary speakers together with some of the review articles from the parallel sessions. The second and third volumes contain the remaining contributions from the parallel sessions. The participant list and the author index complete the third volume.