

Report of the Director

The purpose of the International Foundation High Altitude Research Stations Jungfrauoch and Gornergrat (HFSJG) is to provide the infrastructure and support for scientific research of international significance that must be carried out at an altitude of 3000-3500 meters above sea level or for which a high alpine climate is required. The success of its efforts is measured by the quality of the scientific work and by the extent to which the research infrastructure is used. According to these criteria the year 2004 has again been a successful one. This new issue in our series of annual reports summarizes the major events for the year 2004 within the Foundation HFSJG as well as operational aspects and research activity at Jungfrauoch and Gornergrat. As in previous years, the scientific reports have been prepared by the respective research groups.

The Foundation HFSJG

As of January 1, 2004, the new president of the Foundation, Prof. Hans Balsiger, space physicist and former director of the Physikalisches Institut of the University of Bern, assumed his duties. He succeeded Prof. Gustav Andreas Tammann, who resigned after four years of devoted service to the Foundation.

According to the by-laws of the Foundation HFSJG the Board has its regular meetings only every second year. As the last meeting took place on October 24, 2003, no meeting was scheduled for 2004.

The management of the Foundation recognized with satisfaction that it was possible to consolidate the financing of the Swiss contribution to the operational and maintenance costs of the research stations with the Swiss National Science Foundation and that the finances for 2005 and 2006 are guaranteed.

The Jungfrauoch Commission of the Swiss Academy of Sciences, which looks after the interests of Swiss research within the Foundation, held one meeting on December 13, 2004.

The Astronomic Commission, which acts as a users' and science advisory committee to strengthen the Foundation's internal and external communication, had its regular spring and autumn meetings (May 14 and October 22, 2004).

The meeting of the Board and the General Assembly of the Sphinx AG took place at Jungfrauoch on May 19, 2004.

In the present-day era of permanent changes, websites become rapidly outdated. In response to an urgent need, a new website HFSJG (<http://www.ifjungo.ch/>) was designed by Mr. Michael Moser during the first half of the year, and it became operational in June 2004.

The High Altitude Research Station Jungfrauoch will celebrate its 75th anniversary in the summer of 2006. From its beginnings as an astronomical observatory and a station where acute mountain sicknesses were studied, the Scientific Station Jungfrauoch has evolved during its 75 year history into one of the most renowned centers in Europe for the study of environmental sciences. To celebrate this important event several special projects are planned, as e.g. a scientific conference. Several meetings were devoted to the organization of these events.

The High Altitude Research Station Jungfrauoch

As documented by the individual reports and the lists and statistics, the High Altitude Research Station Jungfrauoch continued to be a place of exceptionally lively and exciting research. In 2004, 29 teams were active at Jungfrauoch. Among a total of 31 research projects, 20 were primarily based on automatic measurements around the clock. Seven applications for major new research projects were approved.

With the exception of Italy (two Italian groups applied for research projects in 2005), all member countries of the Foundation benefited from the excellent research conditions (Figure 1). By number of projects, Germany was the second largest user after Switzerland. Scientists spent a total of 976 person-working days at Jungfrauoch. As shown in Figure 2, this number corresponds to the long-term average. Figure 3 illustrates the relative number of person-working days for 2004 by country. Leading in presence at Jungfrauoch were the Institut d'Astrophysique et Géophysique de l'Université de Liège, the Paul Scherrer Institut, the School of Earth, Atmospheric and Environmental Sciences, University of Manchester, the Institut für Troposphärenforschung and the Max-Planck-Institut für Chemie, Mainz (Cloud Aerosol Characterisation Experiment 3, CLACE 3). Complementing the automatic meteorological measurements, our custodians continued the daily weather observations for the Federal Office of Meteorology and Climatology (MeteoSwiss). The custodians also provide the updates for the internet weather report of the Jungfraubahn.

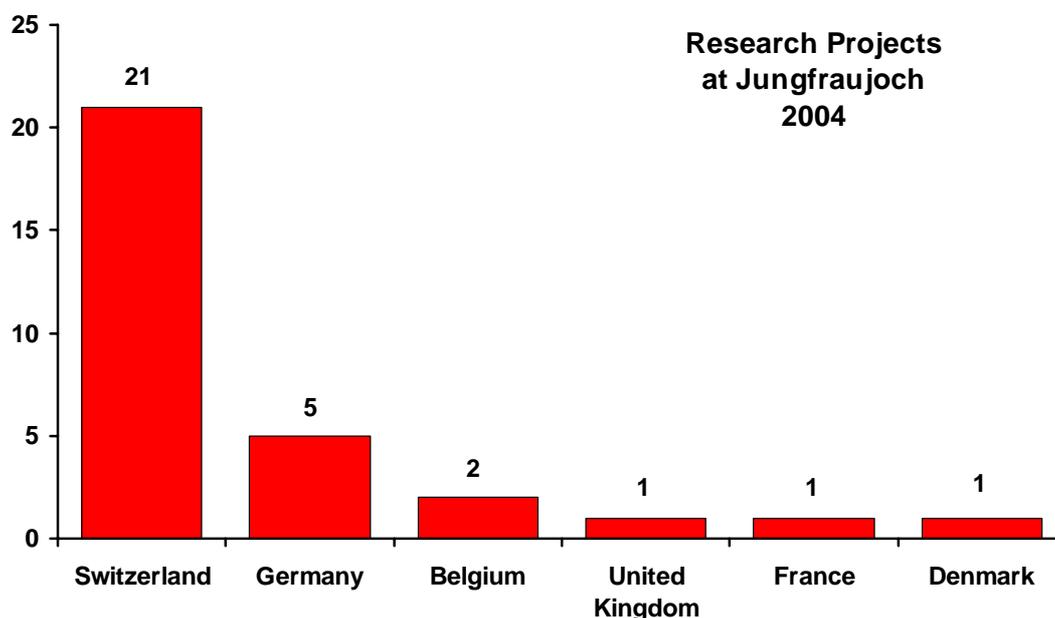


Figure 1: Number of research projects at the High Altitude Research Station Jungfrauoch by country.

The extensive research conducted at Jungfrauoch during 2004 resulted in 110 scientific publications, conference contributions, and data reports. It is noteworthy that young and in particular young women scientists are playing an increasingly active role. In 2004, five Ph.D. theses were based on work conducted at Jungfrauoch.

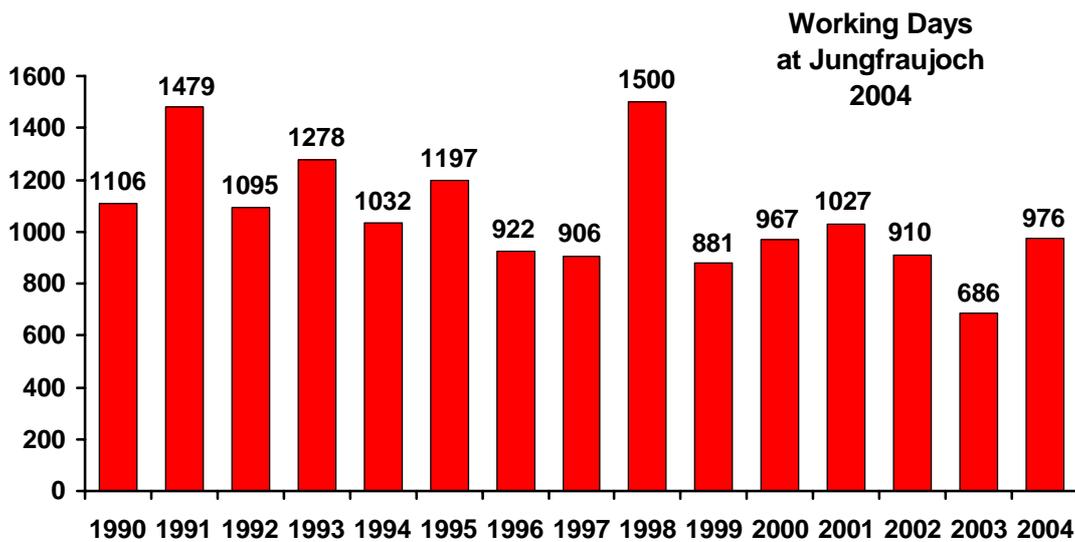


Figure 2: Number of working days spent by scientists at the High Altitude Research Station Jungfrauoch during the past years.

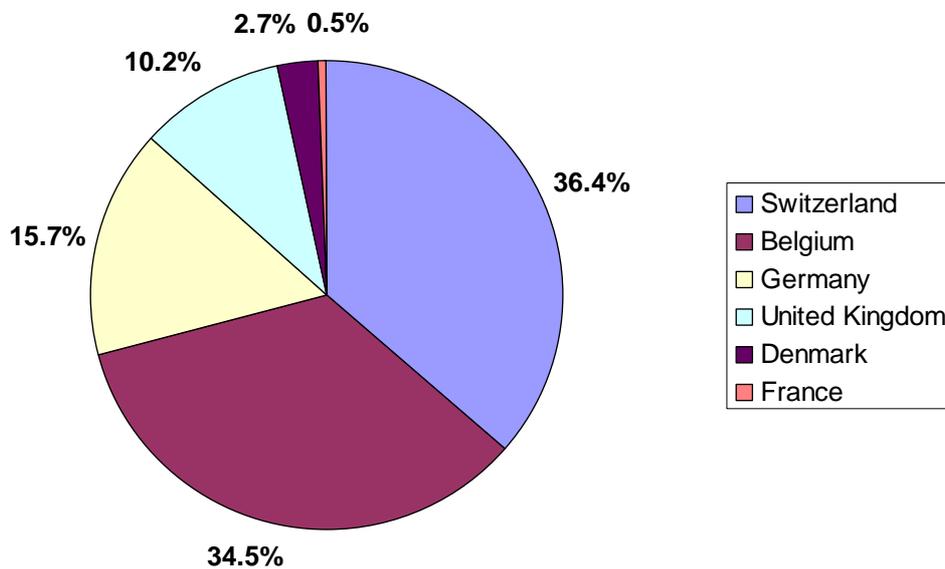


Figure 3: Relative number of person-working days at the High Altitude Research Station Jungfrauoch by country.

Due to the unique location and the unspoiled environment as well as the quality of the scientific work, Jungfrauoch has maintained its role as a center for environmental

research. The site plays a significant role in a number of nationally and internationally coordinated research programs. Jungfrauoch is a key station in the following major networks:

NDSC	Network for the Detection of Stratospheric Change Primary Site
GAW	Global Atmosphere Watch An application has been submitted to the World Meteorological Organization WMO for the certification of Jungfrauoch as a global GAW station (positive decision in February 2005)
SOGE	System for Observation of Halogenated Greenhouse Gases in Europe
EARLINET	European Aerosol Research Lidar Network
CHARM	Swiss Atmospheric Radiation Monitoring Program
ANETZ	Automatic Measuring Network of MeteoSwiss
RADAIR	Swiss Automatic Network for Air Radioactivity Monitoring
NADAM	Netz für automatische Dosis-Alarmierung und -Meldung
NABEL	Nationales Beobachtungsnetz für Luftfremdstoffe (National Air Pollution Monitoring Network)
ASRB	Alpine Surface Radiation Budget Network
AGNES	Automated GPS Network for Switzerland
CarboEuro-IP	Assessment of the European Terrestrial Carbon Balance
TOUGH	Targeting Optimal Use of GPS Humidity
VITA	Varves, Ice cores, and Tree rings – Archives with annual resolution

Jungfrauoch, however, is not only a center for atmospheric and environmental research. The high alpine surroundings are of equal importance, as demonstrated e.g. by the research project conducted by the Swiss Federal Institute of Technology, Laboratory of Hydraulics, Hydrology and Glaciology, Zürich (permafrost temperature monitoring in alpine rock walls). These long-term temperature measurements are of utmost importance for the evaluation of the consequences of the general warming to the high alpine environment in general but in particular for the region of the UNESCO World Heritage Jungfrau-Aletsch-Bietschhorn (JAB). As in previous years, the extraction of climate information from archives within the JAB was again the goal of ice drilling campaigns in the Fiescherhorn/Jungfrauoch area conducted by a joint team of the University of Bern, Laboratory for Radio- and Environmental Chemistry, and the Paul Scherrer Institute within the NCCR Climate project VITA (NCCR Climate: National Centre of Competence in Research on Climate; VITA: Varves, Ice cores, and Tree rings - Archives with annual resolution).

Material sciences are a further topic where the high altitude site Jungfrauoch is becoming increasingly important. During 2004, several experiments were conducted addressing the problem of soft errors on electronic devices due to cosmic rays.

As stated in previous reports, the role of the Research Station Jungfrauoch within the new UNESCO World Heritage Jungfrau-Aletsch-Bietschhorn, JAB, has yet to be defined in detail. In 2004, the President and Director HFSJG participated at a coordination meeting, and the Foundation contributed to the management plan of JAB, making suggestions for the implementation of research.

The Research Station, the scientific activity, and the unique environment of the UNESCO World Heritage Jungfrau-Aletsch-Bietschhorn attracted a number of visitors throughout the year. Several organizations initiated meetings of national and international scientific committees in the Jungfrau region and combined these meetings with an excursion to Jungfrauoch, e.g.

- Technical Personnel Jungfraubahn (March 12, 2004)
- Lawrence Springborg, Opposition Leader in Parliament in Queensland, Australia, on visit at the Australian Embassy in Berlin (March 23, 2004)
- SIBAE-BASIN (Stable Isotopes in Biospheric-Atmospheric Exchange), Interlaken (April 4, 2004)
- Ariane Film „Ultima Thule“ (April 24-30, 2004)
- Dr. Trevor J. Stocki, Comprehensive Test Ban Treaty, Radiation Protection Buro, Canada (May 16, 2004)
- Dr. Noman Fazal Qadir, Chief Executive and Joint Secretary ARUP, Islamabad, Pakistan (June 12, 2004)
- FREETEX-Meeting (Dr. Evi Schüpbach, June 17, 2004)
- Young Atmospheric Scientists Workshop, Interlaken (Dr. Evi Schüpbach, July 20, 2004)
- H.E. Simon Featherstone, British Ambassador to Switzerland, and Dr. Phyllis Starkey, member of Parliament
- DEZA Bern, Chinese delegation from China Earthquake Administration (September 6, 2004)
- Federal Meteorological Commission (September 17, 2004)
- Workshop „Computational Astrophysics“ Wengen (September 30, 2004)
- Workshop “Mountain Glaciers and Society”, Wengen (October 9, 2004)
- Energie Wasser Bern, Direktion (October 15, 2004)
- Einstein-Gesellschaft Bern (October 16, 2004)
- International Workshop on Beam Orbit Stabilization, PSI (December 9, 2004)

The administration HFSJG also received a number of requests for visits to the Research Station from representatives of news media and non-scientific groups. Thanks to the help of the researchers and the custodians more than 80 visits could be realized, and all were extremely well received. Life in the mountains, the high alpine environment, and the research activity were reflected in about 30 contributions in the news (for details please see Publication List in this Activity Report). The scenery of the Jungfrauoch and the scientific station also served as a location for the movie “Ultima Thule” by the Swiss author and producer Hans-Ulrich Schlumpf and his team.

In order to provide the researchers with optimal working conditions, continuous effort is made to keep the environment clean and the infrastructure in good condition. As in previous years, several coordination discussions took place with the management of the Jungfraubahnen. The annual coordination meeting at Jungfrauoch, a platform for the discussion of such items, took place on October 26, 2004, and was attended by the Director HFSJG and Mr. Fischer. Prime topics from our point of view were measures to avoid or minimize disturbances of the scientific measurements by emissions in connection with ongoing and planned construction work or by apparatus defects. A few disturbing emissions were eliminated promptly. The continuous support by Mr. Andreas Wyss, chief of technical services and maintenance division of the Jungfraubahnen at Jungfrauoch, and his team is gratefully acknowledged.

Maintenance work on the infrastructure of the Research Station included completion of repainting the researchers' kitchen area and the staircase. In the library, the old carpet was taken out and the wooden floor was refurbished. A major item was the renovation of the elevator in the scientific station, installing new steering electronics and adapting it to modern safety standards. A safety audit in particular in view of the handling and storage of gases and gas bottles was ordered by the Director and conducted by an expert of the Swiss Accident Insurance Fund, SUVA. A much faster connection of the scientific station to the Internet could be initiated thanks to the support of the management of the Jungfrauabahn and the technical assistance of the Division for Information Services (Informatikdienste) of the University of Bern (broadband Internet access was finally operational in January 2005).

On two occasions, Mrs. Therese Staub and Mr. Hansruedi Staub, former custodians, replaced Mrs. Joan Fischer and Mr. Martin Fischer during a period when Mr. Fischer was not able to go to Jungfrauoch after surgery.

The High Altitude Research Station Gornergrat

Due to its unique location, its clean environment, and the good infrastructure, the High Altitude Research Station Gornergrat, which includes the two astronomical observatories Gornergrat South and Gornergrat North as well as a container laboratory, continued to serve as an excellent basis for astrophysical research.

The Astronomical Observatory Gornergrat North is subleased to the Italian Consiglio Nazionale delle Ricerche (CNR). It is equipped with a 1.5m Cassegrain-Infrared (IR) Telescope (TIRGO). The telescope and related instrumentation are run by the Istituto di Radioastronomia (IRA-CNR), sezione di Firenze, with the assistance of the Osservatorio Astrofisico di Arcetri and the Dipartimento di Astronomia e Scienza dello Spazio of the Università di Firenze. In the near-infrared wavelength range (1-2.5 micron) both images and spectra can be obtained by the camera ARNICA, while the camera TIRCAM2 allows observations in the mid-IR regime (3-20 micron). During 2004 TIRGO had a reduced activity as, during the last months, ARNICA was used as a test instrument for the construction of the Large Binocular Telescope. Also, the Foundation HFSJG was informed by Prof. Gianni Tofani that due to financial problems it would be appreciated if a partner could be found to share operation costs of the observatory Gornergrat North.

The Observatory Gornergrat South is subleased to the Universität zu Köln. Here, the I. Physikalisches Institut der Universität zu Köln has installed the 3m radio telescope KOSMA (Kölner Observatorium für Submillimeter und Millimeter Astronomie). The central topic of the research with KOSMA is the spectrally resolved observation of the global distribution of interstellar matter in the Milky Way and nearby external galaxies, using the important mm-, submm-lines of CO, and atomic carbon. The most advanced technical equipment combined with the excellent observing conditions at Gornergrat allow astronomical observations up to the highest frequencies accessible to ground-based instruments.

Both instruments at Gornergrat are accessible to guest investigators. In 2004, scientists from 13 European and non-European research institutions spent a total of 748 person-working days at the astronomical observatories at Gornergrat (Figures 4 and 5).

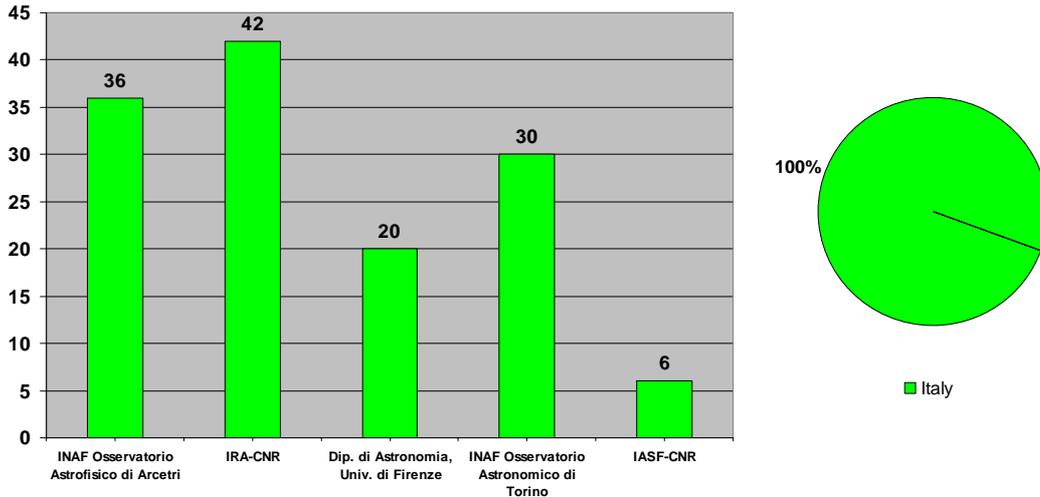


Figure 4: Statistics of the person-working days at the Astronomical Observatory Gornergrat North.

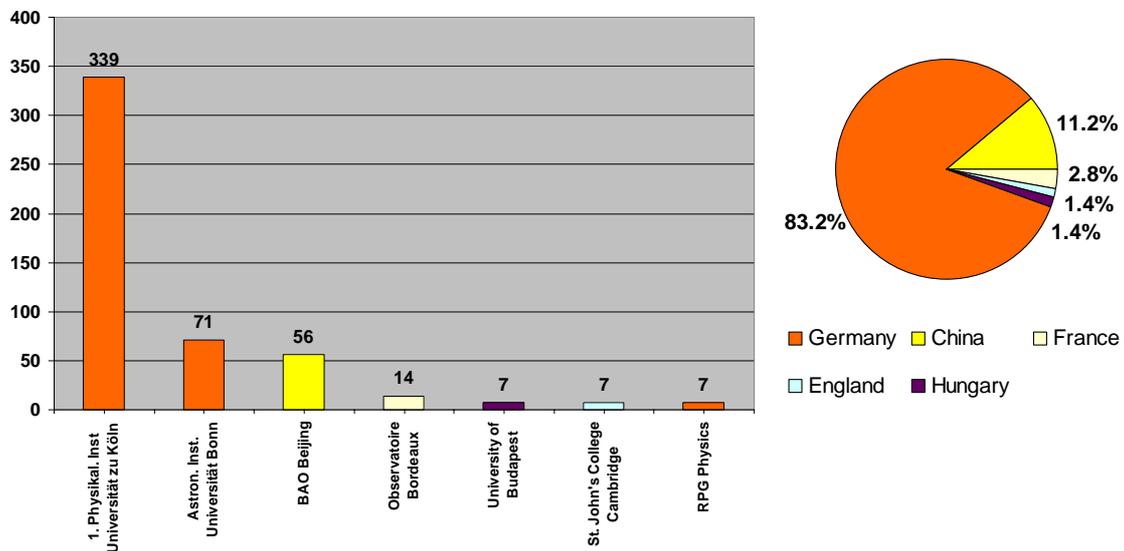


Figure 5: Statistics of the person-working days at the Astronomical Observatory Gornergrat South.

The Institute of Applied Physics of the University of Bern continued its collaboration with the KOSMA team to investigate the spectral development of the radio emission and electron distribution during the acceleration and thermal phase of solar flares. The exciting recordings of the exceptional flare on October 19, 2003, were analysed, and a novel 210 GHz multibeam receiver was developed.

Since 1998, the Space Research and Planetary Sciences Division of the University of Bern has been operating a solar neutron telescope (SONTEL) on the Belvedere plateau. This detector is the European cornerstone of a worldwide network initiated by the Solar-Terrestrial Environment Laboratory of the Nagoya University for the study of high-energy neutrons produced in energetic processes at the Sun. In the absence of enhanced solar activity, analysis of the extremely energetic solar eruptions during the October/November 2003 time period was continued, yielding new insight about solar-terrestrial effects.

The scientific work at Gornergrat during the past year resulted in about 10

publications (one Ph.D. thesis). Details of the activity during 2004 can be found in the individual reports.

An extremely important help for the successful scientific work done at Gornergrat is the continued support provided by the Burgergemeinde Zermatt as the owner of the Gornergrat Kulm Hotel, by the Gornergratbahn, and locally by Mrs. Marianne Schwall and Mr. Uli Schwall as the director of the Kulm Hotel, and his crew.

On April 15, 2004, the President and Director HFSJG were briefed in Zermatt by Mr. René Bayard and Mr. Fernando Clemenz about plans of the Gornergrat-Monte Rosa-Bahnen and the Burgergemeinde Zermatt to do major construction work at Gornergrat, in particular at the Hotel Restaurant Kulm Gornergrat. It became obvious that the North Tower with the TIRGO observatory would be seriously affected. During a second meeting in Bern on December 9, 2004, we then learned that the consequences for the South Observatory would be much more severe than previously anticipated, and that work was planned to start as early as April 2005. Over new year 2004/2005 time was therefore devoted to contacting our partners from the Italian Consiglio Nazionale delle Ricerche (CNR) and the I. Physikalisches Institut der Universität zu Köln to negotiate how to cope with the far-reaching consequences of this situation for the operation of the two observatories not only in 2005, but also in the future. We are confident that in open discussions among all partners involved good solutions will be found to keep Gornergrat as an attractive site both for science and tourism.

Summary and Acknowledgements

As documented by the individual activity reports, the large number of publications, and the feedback from meetings, scientific work at the High Altitude Research Stations Jungfraujoch and Gornergrat during the report period 2004 continued to be extensive and of high international standard. Due to the unique observational and measuring conditions, the Jungfraujoch station has maintained its position as a key station in a number of European and global measuring networks for climate and environmental studies. For the same reasons, Gornergrat continues to be a center for astronomical and astrophysical research. The Foundation HFSJG therefore confirmed its role as a provider of excellent research infrastructure. The hard work and the efforts of all who contributed to this success are highly appreciated and gratefully acknowledged. We also thank all members of the Foundation and their representatives for their support. In particular, we thank the Swiss National Science Foundation for the most significant funding of the Swiss contribution, and in particular Prof. Albert Matter (President Division II), Dr. Paul Burkhard (Head secretariat Division II), and Dr. Jean-Bernard Weber (Head Coordination and Interdivisional Tasks), for the excellent and benevolent collaboration.

Operation of the High Altitude Research Stations Jungfraujoch and Gornergrat would not be possible without the help and support of many individuals and organizations.

For the Jungfraujoch station, our thanks go to our custodians, Mr. and Mrs. Fischer, Mr. and Mrs. Hemund. With their devotion to duty, their competence, and their ability to create a comfortable atmosphere in the station, they are providing the basis for all scientists to do good research work. A special thanks goes to the Jungfrau Railway Holding Ltd and to the Jungfrau Railways. Without their goodwill and their substantial help the Research Station at Jungfraujoch could hardly be operated. Both

the Board of the Jungfrau Railway Holding Ltd under its president Mr. Riccardo Gullotti, as well as the management and personnel of the Jungfraubahnen under Chief Executive Officer Walter Steuri, are always open and positive toward our needs, which quite often conflict with touristic objectives. We gratefully acknowledge the generous direct and indirect support and appreciate the continued interest in the research activity and the scientific output. At Jungfraujoeh we are particularly grateful to Mr. Andreas Wyss, chief of technical services and maintenance, and his team. Our thanks also include Mr. Urs Zumbrunn, and the personnel of the Restaurant Top of Europe.

The great efforts of all these individuals and institutions would, however, be worthless if the research facilities would not be used adequately. We therefore would like to express our sincere gratitude to all scientists for their dedicated work and good collaboration, demonstrating through the excellence of their research that the High Altitude Research Station Jungfraujoeh continues to fulfill an undisputed need of the scientific community.

In this sense, for Gornergrat our thanks go first to all the scientists of the Istituto di Radioastronomia (IRA-CNR), sezione di Firenze, of the Osservatorio Astrofisico di Arcetri and the Dipartimento di Astronomia e Scienza dello Spazio of the Università di Firenze, the I. Physikalisches Institut der Universität zu Köln, and of the University of Bern, and of all collaborating institutions. We then thank the BVZ Holding AG and, in particular, the Gornergrat-Monte Rosa-Bahnen with its president of the board, Mr. René Bayard. The substantial continuous support provided by the Gornergrat-Monte Rosa-Bahnen, by its Chief Executive Officer Hans-Rudolf Mooser as well as the entire crew, has been essential for the success of the scientific work. Finally, we are extremely grateful to the Burgergemeinde Zermatt under the presidency of Mr. Andreas Biner, the members of the Burgerrat, and to Mr. Fernando Clemenz, Director of the Matterhorn Group Holding AG. Without their goodwill and support it would not be possible to operate a world-famous astrophysical observatory at Gornergrat.

At the administrative office in Bern I would like to thank Dr. Urs Jenzer, the technical assistant HFSJG for electronics and computers, for his proficient work. Continued assistance by the Informatikdienste of the University of Bern in networking and data transfer is also gratefully acknowledged. We have greatly appreciated the competent services of our treasurer, Mr. Karl Martin Wyss, and the knowledgeable support and auditing by Mr. Christian Gasser. Last, but not least, I would like to thank our secretary, Mrs. Louise Wilson. Her devotion to the Foundation HFSJG, her competence and flexibility in running the administrative affairs, and her kindness in the daily contacts with staff and scientists are well recognized and highly appreciated.



Erwin O. Flückiger

Bern, April 29, 2005