Report of the Director

This report is the third in the series of annual activity reports initiated by the new management of the Foundation HFSJG which assumed office in the year 2000. While the first of these reports (for 1999/2000) was intentionally comprehensive and detailed, the second one was kept more concise. Following this sequence, and in view of its significance for the next bi-annual meeting of the Board HFSJG to be held in October 2003, the present report is again more comprehensive.

The Foundation HFSJG

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 5, 2001, no meeting was scheduled for 2002.

The report period was marked by the untimely death of the Foundation's Honorary President, Professor Hermann Debrunner, on July 6, 2002. Hermann Debrunner was the competent and enthusiastic Director and President of the Foundation HFSJG for more than 30 years. Thanks to his foresight and hard work, the research stations at Jungfraujoch and Gornergrat have become renowned worldwide, in particular as centers of environmental and astrophysical research. After his resignation, he continued to support the Foundation, gladly sharing upon request from the resources of his vast experience. Scientists, colleagues, and employees will remember him for his fairness, understanding, and wonderful sense of humor. His life, his work, and his services to the Foundation will be honored in more detail in a special obituary. We would like to thank all those who expressed their deep sympathy for this great loss, in particular Swiss Federal Councillor Ruth Dreifuss.

The Astronomic Commission, which has changed its function to that of a users' and science advisory committee to strengthen the Foundation's internal and external communication, had its regular spring and autumn meetings.

The High Altitude Research Station Jungfraujoch

As documented by the individual reports and the lists and statistics, the High Altitude Research Station Jungfraujoch continued to be a place of exceptionally lively and exciting research activity. In 2002, 27 research projects were conducted at Jungfraujoch, 16 of them primarily based on automatic measurements around the clock. With the exception of Italy (whose researchers work exclusively at the Astronomical Observatory Gornergrat North), all member countries of the Foundation benefited from the excellent research conditions (Figure 1). Scientists spent a total of 910 person-working days at Jungfraujoch. As shown in Figure 2, this number is comparable to the activity of the past years. Figure 3 illustrates the relative number of person-working days for 2002 by country. The highest presence at Jungfraujoch had the Institut d'Astrophysique et Géophysique de l'Université de Liège, the LIDAR group from the Laboratoire de Pollution Atmosphérique et Sol de l'Ecole Polytechnique Fédérale de Lausanne (EPFL), and the Paul Scherrer Institut (PSI) in Villigen (Cloud and Aerosol Characterization Experiment CLACE-2). Researchers from the Institut für Medizinische Physik, Universität Innsbruck, Austria, continued their long-term annual measurement campaigns on solar UV irradiance, while scientists from the University of Leeds, UK, were again active within an extended measurement campaign on tropospheric photochemistry (FREETEX 2002).

Complementing the automatic meteorological measurements, our custodians continued the daily weather observations for the Federal Office of Meteorology and Climatology (MeteoSwiss).

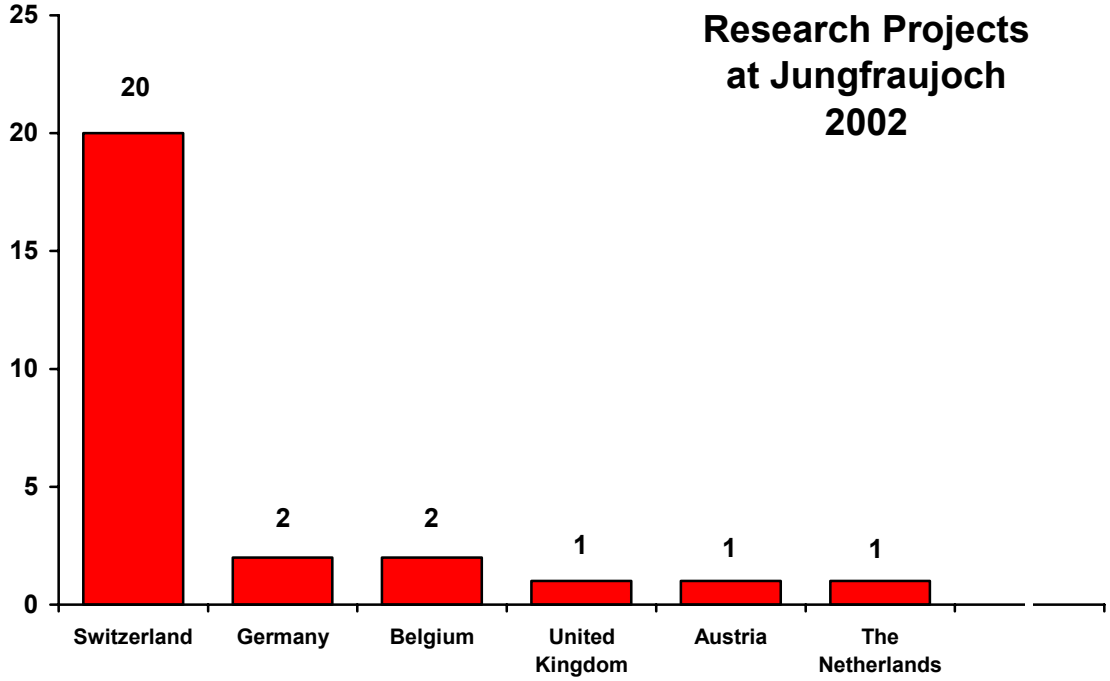

Figure 1: *Number of research projects at the High Altitude Research Station Jungfraujoch by country.*

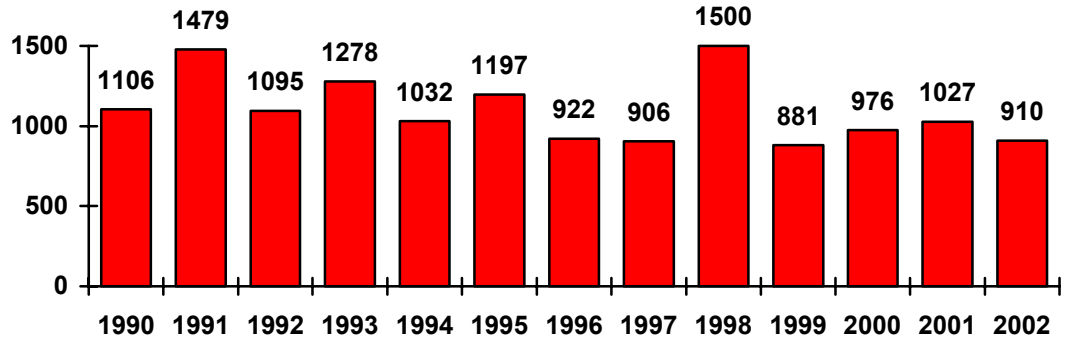

Figure 2: *Number of working days spent by scientists at the High Altitude Research Station Jungfraujoch during the past years.*

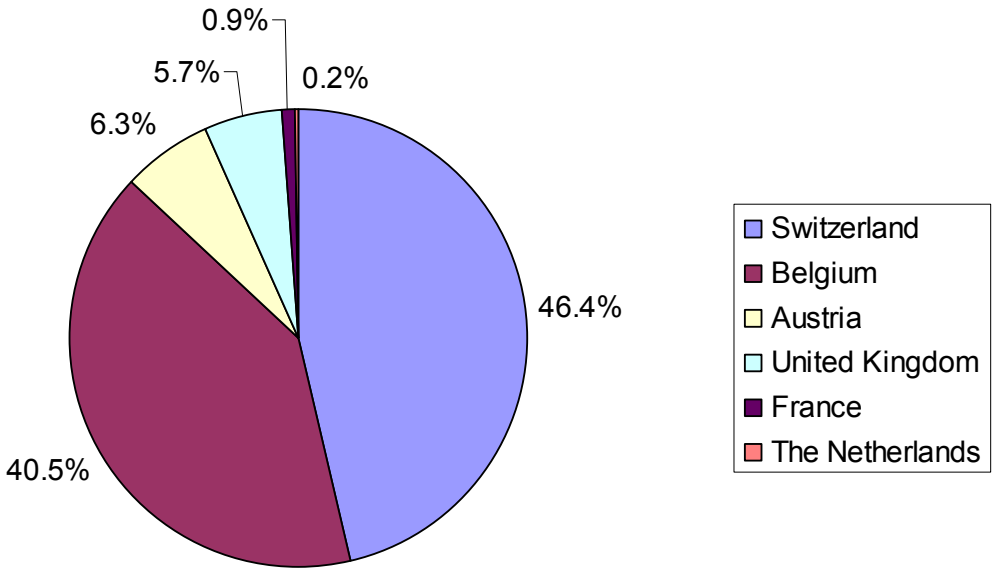

Figure 3: *Relative number of person-working days at the High Altitude Research Station Jungfraujoch by country.*

Due to its unique location and the unspoiled environment, Jungfraujoch has established itself as a center for environmental research, and it plays a significant role in a number of nationally and internationally coordinated research programs. Jungfraujoch is a key station in the following major networks:

NDSC	Network for the Detection of Stratospheric Change Primary Site
GAW	Global Atmosphere Watch
GAW-DACH	European Baseline Station, together with Zugspitze/Hohenpeissenberg (2962 m, Germany) and Sonnblick (3106 m, Austria)
SOGE	System for Observation of Halogenated Greenhouse Gases in Europe
AEROCARB	Airborne European Regional Observations of the Carbon Balance
EARLINET	European Aerosol Research Lidar Network
FREETEX	Free Tropospheric Experiment
ENVINET	European Network for Arctic-Alpine Multidisciplinary Environmental Research
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

ENVINET is an "Infrastructure Co-operation Network" focusing on multidisciplinary environmental research in Northern Europe. The network, funded under "Enhancing Access to Research Infrastructures" of the "Human Potential Programme" of the EU 5th framework program involves 17 research stations from the European Alps to the Arctic. Each station participates with representatives from its operator and their scientific users. The duration is May 2000 - April 2003. Jungfraujoch was represented by Dr. Martine De Mazière, Belgian Institute for Space Aeronomy, Brussels. From September 12-15, 2002, the Director HFSJG participated in the 4th ENVINET General Meeting in Abisko, Sweden. Part of this meeting was devoted to a 'Station Managers Forum'. The overall goal of this forum was to learn from each other and to discuss what practices are handled at the different stations. The interaction and discussions with colleagues was extremely profitable for the administration HFSJG.

The extensive research conducted at Jungfraujoch during 2002 is summarized in the reports of the individual groups. This research activity resulted in 87 scientific publications.

The variety of atmospheric research at Jungfraujoch and in the Alps was demonstrated in an impressive manner at the workshop on 'Atmospheric Research at the Jungfraujoch and in the Alps' at Davos on September 20, 2002. This workshop, jointly organized by the Commissions 'High Altitude Research Station Jungfraujoch' of the Swiss Academy of Sciences (SAS) and the newly founded SAS commission 'Atmospheric Chemistry and Physics' took place within the 182nd SAS Annual Meeting. It was a complete success. More than 50 participants from all over Europe, and in particular from neighbouring high altitude research stations, followed a highly interesting program with 12 oral and 29 poster presentations. The workshop was an ideal platform for strengthening the scientific interaction among the various groups involved in atmospheric research at Jungfraujoch. We would like to thank PD Dr. Urs Baltensperger, PSI, for the lead in the organization of this workshop, and Mrs. Doris Hirsch-Hoffmann for editing the proceedings.

An equally impressive review of research at Jungfraujoch was presented at the 'Third GAW-CH Conference, held in Zürich on October 23, 2002. This conference, organized by the Federal Office of Meteorology and Climatology (MeteoSwiss), the Swiss Agency for the Environment, Forests and Landscape (SAEFL), and the Swiss Federal Institute of Technology, Zürich, was devoted to the presentation and discussion of scientific and technical achievements. The research and development activities were highlighted in four sessions dedicated to aerosols, gaseous tropospheric constituents, stratospheric ozone, and radiation. The proceedings of the meeting reflect the excellent GAW-activity at Jungfraujoch. Dr. John D. Miller, Chief of Environment Division, WMO Atmospheric Research and Environment Programme, pointed out in his closing remarks that the measurement programs at Jungfraujoch for aerosols, greenhouse and reactive gases in the troposphere, and stratospheric ozone have developed into one of the 'most complete and sophisticated in the GAW system'.

Jungfraujoch, however, is not only a center for atmospheric and environmental research. The high alpine glacial surroundings are of equal importance, as demonstrated e.g. by the three research projects conducted by the University of Zürich, Department of Geography, Glaciology and Geomorphodynamics Group, by the Swiss Federal Institute of Technology, Laboratory of Hydraulics, Hydrology and Glaciology, Zürich, and by a joint team of the University of Bern, Laboratory for

Radio- and Environmental Chemistry, and the Paul Scherrer Institute. It is anticipated that the Research Station Jungfraujoch will serve increasingly as a base for ice drilling campaigns in the Fiescherhorn/Jungfraujoch area, e.g. within programs and projects of the National Center of Competence in Research on Climate (NCCR Climate).

The Research Station, the fascinating scientific activity, and the unique environment of the new UNESCO World Heritage Jungfrau-Aletsch-Bietschhorn have a fascinating public outreach, attracting a number of visitors. As in previous years, several organizations initiated meetings of national and international scientific committees in the Jungfrau region and combined these meetings with an excursion to Jungfraujoch, e.g.

- Ecole Polytechnique Fédérale de Lausanne (EPFL), Journées scientifiques et pédagogiques 2002 (March 7, 2002)
- COST 720 Workshop (October 13, 2002)
- Swiss-Japanese Seminar on Ozone and the Links with Climate (July 4, 2002)
- QUEEN Conference (Quaternary Environments of the Eurasian North; May 27, 2002)
- Steering Committee, National Research Programme NRP48 (Landscapes and Habitats of the Alps; August 31, 2002)

On June 6, 2002, the Research Station was honored by the visit of the Research Council of Division II of the Swiss National Science Foundation, headed by its President, Prof. Albert Matter.

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 most of them could be realized, and all were extremely well received. Life in the mountains, the high alpine environment, and the research activity were reflected in more than 20 contributions in the news. The special exhibition called “Jungfrau, Mönch & Eiger” in the Swiss Alpine Museum in Bern was particularly well appraised. Initiating a new trend, several students of vocational and pre-university schools selected a topic related to research at Jungfraujoch for writing a study-paper. They were all given the opportunity to spend one day at Jungfraujoch and to accompany our custodians during their daily work. In an effort to improve public outreach, the popular information brochure distributed by the Jungfraubahnen free of charge to all visitors of Jungfraujoch / Top of Europe is presently being re-edited.

In order to provide the researchers with optimal working conditions, continuous effort is needed 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. Prime topics 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. With only a few exceptions, no combustion engines were used for the construction of the new Plateau exit and tourist hall which was inaugurated on April 19, 2002. A few disturbing emissions due to technical malfunctions were eliminated promptly. We highly appreciate these efforts and are grateful to the Jungfraubahnen for their understanding and their cooperation. During 2002, Mr. Andreas Wyss, chief of technical services and maintenance division of the Jungfraubahnen at Jungfraujoch, succeeded in solving the occasional problem of too high temperatures in the Sphinx building. Finally, we appreciate the cooperation in the planning of the new fast data transmission fiber cables in the tunnel

to satisfy the increasing needs in data transfer capacity by the users of the Research Station.

No major maintenance work on the infrastructure of the Research Station was scheduled for 2002. However, in two cases unexpected work was necessary. The first was related to a recurring problem at Jungfraujoch: water leakage. To help find the source of water leakage in the Sphinx building, the Jungfraubahnen contracted B+S Ingenieur AG, the engineering office that built the new addition to the Sphinx, to inspect the building. Their expert, Mr. Wenger, was able to identify a few problem locations, especially on the flat roof. After some urgent isolated repairs to stop the acute leakage, more extensive repair was done during the summer months. However, a general revision, or at least a new coating of the roof should eventually be considered. The second case concerned the 'maison des rats', a two-story wooden construction in the cavern behind the Research Station. This construction dated back to the early days of the station when animals were kept there for use in experiments. For many years it had no longer been used for its original purpose but instead served as a storage room. In December 2001, dry rot was discovered in and around the stall, and drastic measures had to be taken immediately to prevent this extremely dangerous fungus from spreading to other parts of the station. Experts were called in to evaluate the situation. The construction had to be torn down completely. The infected material was discarded in a controlled manner, and the entire cavern was fumigated to prevent a recurrence of the fungus.

Optimal working conditions are, however, for the most part the result of the work of our custodians. At the end of December 2001, Mrs. Therese Staub and Mr. Hansruedi Staub retired as our main custodians after five years of devoted service to our Foundation. They were succeeded by Mrs. Joan Fischer and Mr. Martin Fischer. As former custodians at the Schilthorn they have experience in living and working at high altitude, and they started the new challenge with enthusiasm. Mr. and Mrs. Fischer have even joined the Jungfraujoch fire brigade, which is of great benefit to the Research Station as well as to the entire site. The strong interdependence of all those having responsibilities at Jungfraujoch is impressively demonstrated by the fact that our custodians assisted to several search and rescue operations in the Jungfrau area, the two most dramatic ones both over the New Year's holidays in 2001/2002 and 2002/2003.

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. During the winter observation period 2001/2002 the weather conditions were especially good. Dr. Miller from the 'I. Physikalisches Institut der Universität zu Köln' even speaks of the 'best winter ever, with 30 days of sub-millimeter conditions'!

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 (former CAISMI), with the assistance of the 'Osservatorio Astrofisico di Arcetri' and the 'Dipartimento di Astronomia e Scienza dello Spazio' of the 'Universita' di Firenze'. During the winter

months 2001/2002 and again after the summer season, which is not suited for IR observations, observing activity was high. The demands from the Italian astronomical community on TIRGO still exceeds the available observing time, despite the fact that near-IR observations can be done at several other larger telescopes. TIRGO was used very actively with the near-infrared camera ARNICA, the near-IR fast photometer FIRT, the long-slit spectrometer LONGSP. As an example, the long-term project of lunar occultations has reached the world record of 400 events. All ARNICA images and the LONGSP spectra, available to the international astronomical community after a proprietary period of one year, can now be downloaded from the TIRGO website (www.arcetri.astro.it/irlab/tirgo/index.html). The new mid-IR camera TIRCAM2, implemented in 2001, is now fully operational. This new camera is based on a modern array sensitive up to 26 microns. Its performance permits full use of the unique properties of the Gornergrat site in terms of low temperature (reducing the disturbing emission from the background) and low water vapor content (making the atmosphere particularly transparent). It is expected that this novel instrument will provide exceptional observational results to further promote TIRGO.

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 KOSMA telescope with its high-tech receivers and spectrometers allows the observation of interstellar and atmospheric molecular lines in the millimeter and submillimeter range. Since September 2001 the new dual frequency SIS (superconductor-insulator-superconductor) array receiver SMART has been operational. This is worldwide the first two-frequency channel array receiver. 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. Research topics in 2002 included the large-scale distribution, physical and chemical conditions of the interstellar matter in the Milky Way, the Galactic Molecular Ring (the brightest extended object of the Milky Way, beside the Galactic center region), the massive star-forming region W3 Main in the Perseus arm, the most active, nearby giant molecular cloud complex Cygnus X, and galactic cirrus clouds.

Both instruments at Gornergrat are accessible to guest investigators. The Institute of Applied Physics of the University of Bern has continued its collaboration with KOSMA in the observation of solar flares at high frequencies. It is expected that together with recordings of the other six telescopes of the University of Bern dedicated to solar flare monitoring at frequencies from 8.4 to 89.4 GHz, and with hard and soft x-ray observations, the KOSMA observations will contribute significantly to a better understanding of the temporal and spatial evolution of electron acceleration in solar flares.

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. It is expected that this detector will play an essential role in the study of solar neutron events. Although SONTEL was in continuous operation during 2002, no solar neutron events were recorded. However, in December 2002, with the Sun showing no evidence for high-energy activity, a period of increased count rates was observed in association with enhanced environmental radioactivity. This event is similar to the one recorded in

April 2001, the cause of which is still unknown. In order to identify the cause of these intensity increases, continuous on-site monitoring of the environmental radioactivity was initiated. Also, for a proper interpretation of the SONTEL recordings, the response of this detector both to the local particle flux and to the primary particle flux penetrating the Earth's atmosphere was determined with GEANT Monte Carlo applications.

The scientific results achieved at Gornergrat during the past year have found world-wide recognition. The work resulted in 15 publications. Details of the activity during 2002 can be found in the individual reports.

As is the case with Jungfraujoch, Gornergrat is an equally attractive site for visitors. On June 15, 2002, the Board of Directors of the Jungfraubahn gave us the honor. On August 8, 2002, on occasion of the 50th anniversary celebrations of the Swiss National Science Foundation, the participants of the international jubilee workshop "Major Challenges for Research Funding Agencies at the Beginning of the 21st Century" visited Gornergrat and were given a tour of the research facilities. The research teams from Florence and Cologne seized the opportunity to present their observatories and their work to this prominent group of distinguished guests from all over the world.

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.

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 2002 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 unique center for outstanding astronomical and astrophysical research. The Foundation HFSJG, therefore, confirmed its role as a provider of excellent research infrastructure ensuring bright perspectives for the future. 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, and Mr. and Mrs. Jenni. 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 former president Dr. Georg Krneta and his successor 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 Jungfraujoch we are particularly grateful to Mr. Andreas Wyss, chief of technical services and maintenance, for his continuous support.

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 Jungfraujoch 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 'Universita' di Firenze', the 'I. Physikalisches Institut der Universität zu Köln', and of the University of Bern. 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. 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.

Bern, February 18, 2003 Erwin O. Flückiger