

Report of the Director

It gives us great pleasure to summarize with this new issue in our series of annual reports the major events that characterized the year 2005 within the International Foundation High Altitude Research Stations Jungfrauoch and Gornergrat (HFSJG). Again, we can look back on a year rich in successful scientific activity at the research stations, as documented by the individual reports that have been prepared by the respective research groups. The year 2005 was, at the same time, a very special year for the Foundation HFSJG, its administration, and the operation of the scientific stations.

The Foundation HFSJG

On October 21, 2005, the Board of the Foundation HFSJG met at the Grand Hotel Victoria-Jungfrau in Interlaken for its regular meeting held every odd numbered year. This meeting was at the same time the jubilee meeting to celebrate the 75th anniversary of the Foundation. The president, Prof. Hans Balsiger, had the honor to welcome the members of the board, the Jungfrauoch Commission of the Swiss Academy of Sciences scnat, the Astronomic Commission HFSJG, and a number of distinguished guests. The annual activity reports 2003 and 2004 as well as the statement of accounts for both years were approved unanimously and with no abstentions. The extensive and excellent scientific output that resulted from the research at Jungfrauoch and Gornergrat was recognized with great pleasure and satisfaction. Belgium was formerly represented in the Foundation by two members, the Fonds National de la Recherche Scientifique (FNRS) and the Fonds voor Wetenschappelijk Onderzoek - Vlaanderen (FWO). The FWO resigned its membership because no further work is being done at Jungfrauoch by Flemish researchers. As a result the FNRS has graciously assumed the responsibility of full membership. Italy's representative in the Foundation changed from CNR (Consiglio Nazionale delle Ricerche) to the newly formed INAF (Istituto Nazionale di Astrofisica). In response to new laws governing the auditing of foundations, the administration of the Foundation HFSJG made a changeover to fully professional auditing. Treuhand Cotting AG, Bern, was elected for the auditing in the years 2006-2007. Finally, the board HFSJG elected Prof. Gustav Andreas Tammann, its former president, as Corresponding Member of the Foundation, honoring thus his meritorious service to the Foundation. As usual, a number of interesting scientific reports concluded the meeting. On Saturday, October 22, 2005, a small group of delegates visited the High Altitude Research Station Jungfrauoch.

The Jungfrauoch Commission of the Swiss Academy of Sciences, scnat, which looks after the interests of Swiss research within the Foundation, held no meeting in 2005.

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 (April 15 and October 21, 2005).

The meeting of the Board and the General Assembly of the Sphinx AG took place at Jungfrauoch on March 11, 2005.

The Foundation was invited to make a contribution to the management plan of the UNESCO World Heritage Jungfrau-Aletsch-Bietschhorn (JAB).

Starting in spring 2005, the buildings at Gornergrat that are the property of the Burgergemeinde Zermatt and the Gornergrat Bahn underwent a complete refurbishing to make the entire site more attractive for tourists and as well as for science. The extended renovation work necessitated closing the Kulm Hotel and both observatories from April through December. Upon the announcement of the renovation and the ensuing interruption of all operations, INAF decided that this was an appropriate time to conclude the present contract for Gornergrat North (which was due to expire in 2005 anyway) and to completely dismantle TIRGO. This leaves the future of Gornergrat North open, but discussions are ongoing, although no final solutions have been found. The Burgergemeinde would like for us to use Gornergrat North to embed science in public outreach and tourism. Since January 1, 2006, there has been no one at the Observatory Gornergrat North.

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 environmental sciences. To celebrate this important event several special projects are planned. One of them is an international scientific conference to be held from September 11-14, 2006, at the Casino-Kursaal in Interlaken. A scientific committee, headed by Prof. Heinz Hugo Loosli and the director HFSJG, is in the process of organizing the conference. An extraordinary meeting of the board HFSJG is scheduled for September 14, 2006.

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 2005, 36 teams were active at Jungfrauoch. Among a total of 41 research projects, 20 were primarily based on automatic measurements around the clock. In February, in response to a proposal by Mr. Daniel Keuerleber, director of MeteoSchweiz, the research station Jungfrauoch was named the 23rd global GAW (Global Atmosphere Watch) station by the World Meteorological Organisation (WMO). Please see the WMO announcement on page 221.

All member countries of the Foundation benefited from the excellent research conditions (Figure 1). By number of projects, Germany was again the second largest user after Switzerland. Scientists spent a total of 1432 person-working days at Jungfrauoch. As shown in Figure 2, this number is well above the long-term average. Figure 3 illustrates the relative number of person-working days for 2005 by country. Leading in presence at Jungfrauoch were the Institut d'Astrophysique et Géophysique de l'Université de Liège (350 person-working days), the Institute for Human Movement Sciences, Swiss Federal Institute of Technology Zurich (ETHZ), and Institute of Physiology, University of Zurich (247), the Paul Scherrer Institut (123), and the School of Earth, Atmospheric and Environmental Sciences, University of Manchester (101). Participants of the Cloud Aerosol Characterisation Experiment 4 (CLACE 4) spent more than 540 days at the research station. 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 Jungfraubahnen.

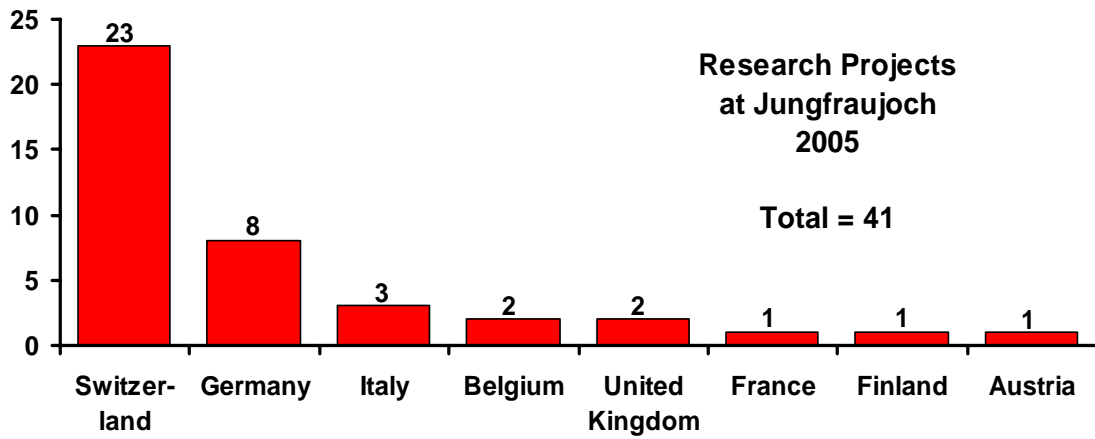


Figure 1: Number of research projects at the High Altitude Research Station Jungfrauoch by country.

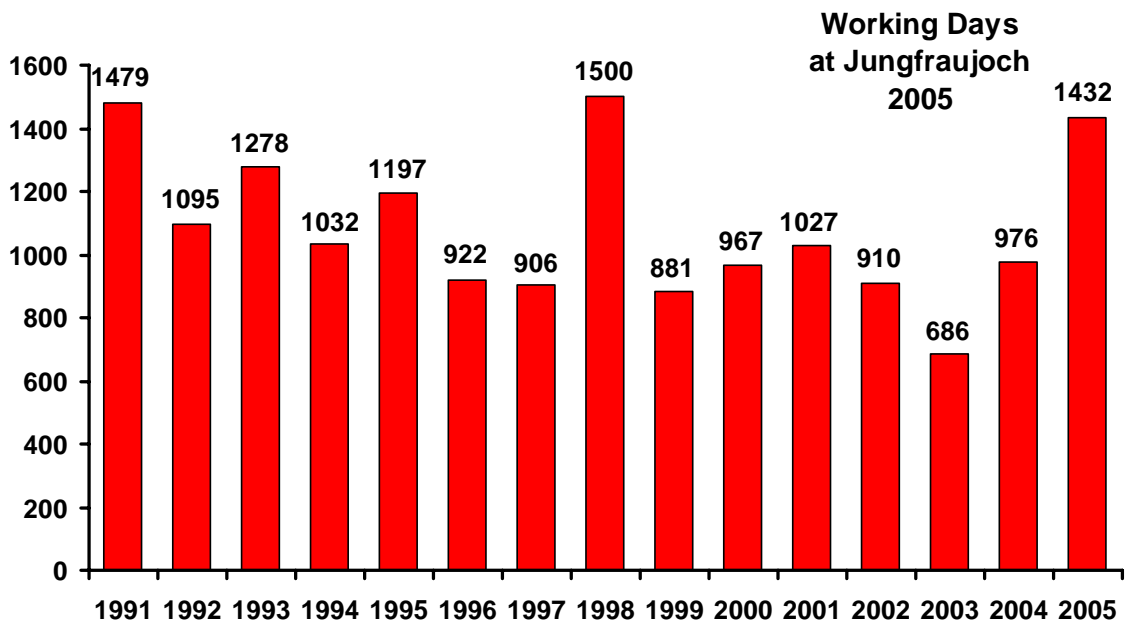


Figure 2: Number of working days spent by scientists at the High Altitude Research Station Jungfrauoch during the past years.

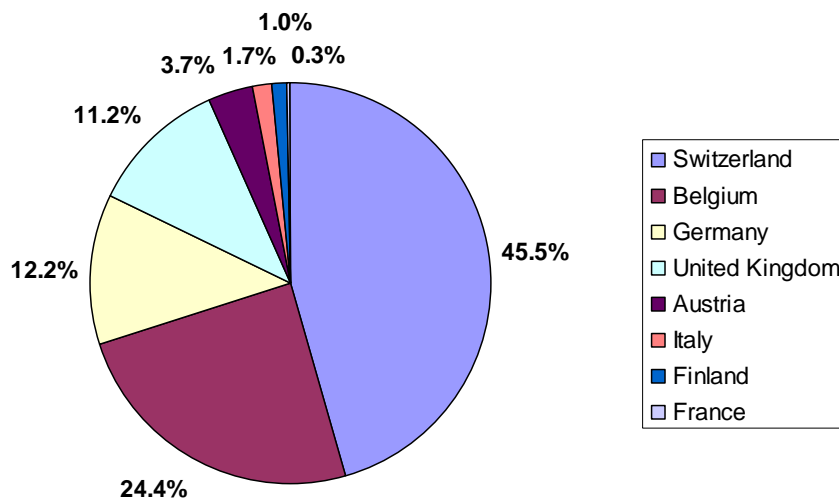


Figure 3: Relative number of person-working days in 2005 at the High Altitude Research Station Jungfrauoch by country.

The extensive research conducted at Jungfraujoch during 2005 resulted in 125 scientific publications, conference contributions, and data reports, many of them by young scientists. Three Ph.D. theses were based on work conducted at Jungfraujoch.

Due to the unique location and the unspoiled environment as well as the quality of the scientific work, Jungfraujoch 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. Jungfraujoch is a key station in the following major networks:

NDSC	Network for the Detection of Stratospheric Change Primary Site
GAW	Global Atmosphere Watch Global GAW Station
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

Jungfraujoch, 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, and 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/Jungfraujoch 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 Jungfraujoch is becoming increasingly important. As in the years before, several experiments were again conducted addressing the problem of soft errors on electronic devices due to cosmic rays.

We were particularly pleased to host again an extensive medical experiment. During the months of July and August a medical team from ETHZ and University Zurich

headed by Dr. Susi Kriemler studied the effects of high altitude and mountaineering on children in the age group 9-12 by monitoring nine father and son/daughter teams.

As part of the Einstein year celebrations, a spark chamber was built by the Laboratory of High Energy Physics, Physikalisches Institut, University of Bern (Prof. Klaus Pretzl and his team), in collaboration with CERN. The spark chamber, installed with support by the Jungfrauabahn in the tourist area of the Sphinx, is monitored via Internet to the Historisches Museum in Bern, as part of the Einstein exhibition.



Figure 4: Tourists watching the spark chamber at the Sphinx.

Within a further action of public outreach students from the Kantonsschule Zürcher Unterland in Bülach spent part of their “Research in Switzerland” project week at Jungfrauojch with the director HFSJG and tutor Mr. Kuno Strassmann from the University of Bern (see Picture of the Month, May 2005).

As stated in previous reports, the role of the Research Station Jungfrauojch within the new UNESCO World Heritage Jungfrau-Aletsch-Bietschhorn, JAB, has yet to be defined in detail. In 2005, the Foundation was invited to contribute to the management plan of JAB.

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 Jungfrauojch, e.g.

- Climate Group Meeting, University of Fribourg (Prof. M. Beniston, April 4, 2005)
- Workshop on Solar Variability and Planetary Climates, (International Space Science Institute, ISSI, Bern, June 11, 2005)
- European Physical Society Meeting EPS-13 (July 10, 2005)
- Bundesamt für Umwelt, Wald und Landschaft (BUWAL), Abteilung Internationales (August 10, 2005)
- Paul Scherrer Institute, Board of Directors (September 2, 2005)

- Wengen Workshop “Climate, climatic change, and human health” (Prof. M. Beniston, September 15, 2005)
- Bundesamt für Statistik, Neuchâtel (September 18, 2005)
- The 23rd Pediatric Work Physiology Meeting, Gwatt (Dr. S. Kriemler, September 26, 2005)
- Bayerisches Staatsministerium für Umwelt, Gesundheit und Verbraucherschutz, verantwortlich für die Umwelt Forschungsstation Schneefernerhaus auf der Zugspitze (Ministerialdirigent Prof. Dr. S. Specht, December 12, 2005)

It was a very special pleasure for the director HFSJG to welcome Mrs. Elisabeth von Muralt, the daughter of the Foundation’s former president Prof. Alexander von Muralt, and her family (July 1, 2005).

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 70 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 media (for details please see the lists at the end of this report). The scenery of the Jungfrauoch and the scientific station also served as a main subject for several reports on Swiss and foreign TV channels.

For a period of several months, the scientific station was also subject of the art performance “Imachination” (<http://www.imachination.net/next100/press/index.htm>) by German artist Tim Otto Roth.

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 25, 2005, and was attended by the director HFSJG and Mr. Fischer. Prime topics from our point of view were again the measures to avoid or minimize disturbances of the scientific measurements by emissions in connection with construction work or by apparatus defects, as well as problems with high temperatures in the Sphinx buildings. The continuous support by Mr. Andreas Wyss, chief of technical services and maintenance division of the Jungfraubahnen at Jungfrauoch, of Mr. Fritz Jost and Mr. Heinz Schindler is gratefully acknowledged.

Maintenance work on the infrastructure of the Research Station included repairs on water and waste water pipes. A much faster data connection and broadband access of the scientific station to Internet was put into operation at the beginning of the year thanks to the support of the management of the Jungfraubahnen and the technical assistance of the Division for Information Services of the University of Bern (Informatikdienste, Dr. Fritz Bütikofer). A new administration software was developed by Mr. Urs Jenzer, our PC and network coordinator.

Unfortunately, Mrs. Joan Fischer had a ski accident in spring and had to undergo surgery. Mr. and Mrs. Hemund and Mrs. Therese Staub, former custodian, were so kind to help out during Mrs. Fischer’s recovery phase.

There was a major emergency on August 22, due to serious flooding in the entire region of Interlaken, Lauterbrunnen, and Grindelwald. As illustrated in Figure 5, in

only 48 hours approximately 200mm of rain were recorded in several regions in Switzerland. Severe damage was done in particular to the track of the Bernese Oberland Railway, BOB, between Interlaken and Grindelwald. Fortunately nothing happened to the infrastructure of the research station; there was only a temporary disruption in electricity (as illustrated in Figure 6) and of the communication facilities. The Jungfraubahnen did a truly marvelous job of restoring communication and immediately organizing bus transportation where needed.

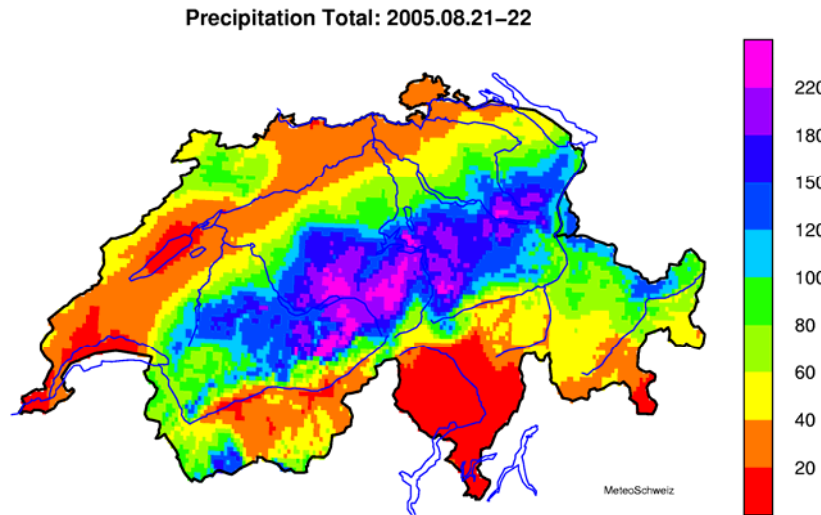


Figure 5: Sum of 48-hour rainfall (in mm) on August 21/22, 2000. (Mr. C. Frei, MeteoSwiss; please see also the report by MeteoSwiss in this volume on page 159).

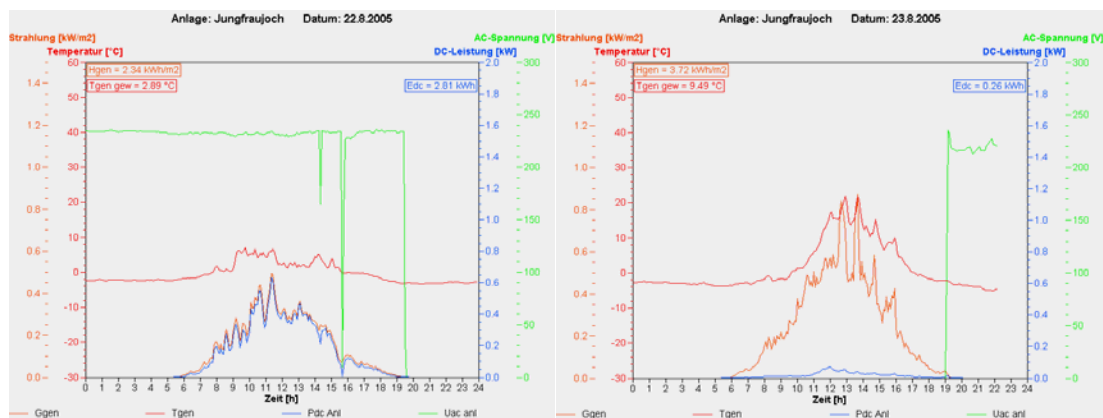


Figure 6: The AC power outage (green curve) during the flooding period of August 22nd/23rd, 2005 as recorded by the photovoltaic power plant operated in the High Altitude Research Station Jungfrauoch by the Berner Fachhochschule, Hochschule für Technik und Informatik, Burgdorf (courtesy Prof. Heinrich Häberlin).

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, continues to be an excellent basis for astrophysical research.

Since 1974 the Astronomical Observatory Gornergrat North was subleased to the Italian Consiglio Nazionale delle Ricerche (CNR). In 1979 it was equipped with a 1.5m Cassegrain-Infrared (IR) Telescope (TIRGO). The telescope and related instrumentation were 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 could be obtained by the camera ARNICA, while the camera TIRCAM2 allowed observations in the mid-IR regime (3-20 micron).

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, conducted jointly with the Radioastronomisches Institut, Universität Bonn, 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.

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.

As already mentioned above, the year 2005 was a year of construction at Gornergrat. Starting in spring, the buildings that are the property of the Burgergemeinde Zermatt and the Gornergrat Bahn underwent a complete refurbishing to make the entire site more attractive for tourists and as well as for science. The Gornergrat Bahn and the Burgergemeinde Zermatt invited the Foundation to information meetings to discuss the planning. Because a universal renovation was to be carried out, all operations at Gornergrat were suspended during the summer months, i.e. no hotel, no astronomic observations. With the exception of a few interruptions, the cosmic ray experiment in the laboratory container, however, could be operated throughout the year. Gornergrat South now has newly renovated rooms and a new kitchen, and KOSMA was back in operation by the end of November 2005. New rent contracts for Observatory Gornergrat South will be forthcoming for January 1, 2006. Upon the announcement of the renovation and the ensuing interruption of all operations, INAF decided that this was an appropriate time to conclude the present contract for Gornergrat North (which was due to expire 2005) and to completely dismantle TIRGO. As Dr. Filippo Mannucci states in his final report (please see page 173) “the telescope had a great impact on Italian astronomy as, in the late ‘70s, it was one of the first five telescopes in the world capable of infrared observations. The development of this telescope and of its instrumentation had the consequence of creating a competitive group of infrared

astronomers and technicians.” Part of the former Observatory Gornergrat North, i.e. the living quarters, have been transformed into hotel rooms. The end of the TIRGO era leaves the future of Gornergrat North open, but discussions are ongoing although no final solutions have been found. The Burgergemeinde Zermatt would like the Foundation HFSJG to use Gornergrat North to embed science in public outreach and tourism. Negotiations with a first interested party were not successful, however. Therefore, since January 1, 2006, there has been no one at the Observatory Gornergrat North.



Figure 7: Construction scene at Gornergrat, **Figure 8:** Dr. Martin Miller in the new kitchen of the Observatory Gornergrat South.

Despite the interruptions during the major part of the year, the number of working days at Gornergrat is still remarkable. Figure 9 shows the statistics for Gornergrat South. However, a large fraction of the working days of the I. Physikalisches Institut der Universität zu Köln was related to the construction work and not to scientific observations.

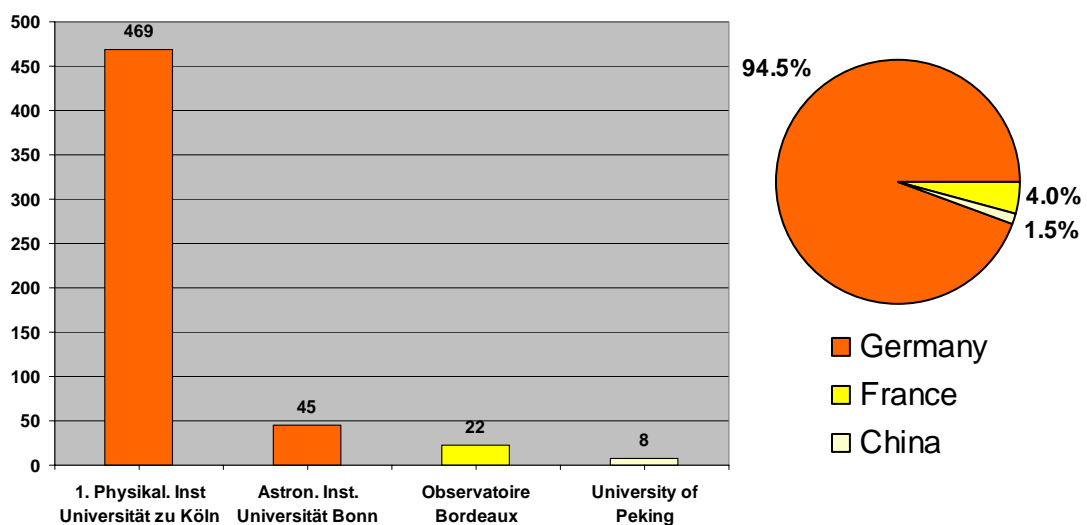


Figure 9: Statistics of the person-working days at the Astronomical Observatory Gornergrat South.

During the last couple of years the region of the Gorner glacier became increasingly interesting to the glaciologists of the Versuchsanstalt für Wasserbau, Hydrologie und Glaziologie (VAW) of the Swiss Federal Institute of Technology in Zurich (ETHZ). In 2005, the teams under the leadership of Prof. Martin Funk spent about 400 working days near and at the Gornersee in order to study the processes controlling the drainage of glacier-dammed lakes (see the corresponding report on page 185).

In 2005, nine scientific papers were published based on work at Gornergrat, and two PhD theses were completed. Details can be found in the individual reports.

An extremely important help for the operation of the observatories and the successful scientific work at Gornergrat is the continued support provided by the Burgergemeinde Zermatt as the owner of the Gornergrat Kulm Hotel, by the Gornergrat Bahn, and locally by Mrs. Marianne Schwall and Mr. Uli Schwall as the directors of the Kulm Hotel, and their crew. We very much regret that Mr. and Mrs. Schwall left their position for a new challenge at the end of the year 2005.

The Foundation HFSJG is confident with the improved infrastructure and the prospective new use of the observatory Gornergrat North the site will strengthen its position 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 Jungfrauoch and Gornergrat during the report period 2005 continued to be extensive and of high international standard. Due to the unique observational and measuring conditions, the Jungfrauoch 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, and even more so after the refurbishing, Gornergrat continues to be a center for astronomical and astrophysical research. The Foundation HFSJG 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. Hans Rudolf Ott (President Division II), Dr. Paul Burkhard (Head secretariat Division II), and Dr. Jean-Bernard Weber (Vice Director), for the excellent and benevolent collaboration.

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

For the Jungfrauoch 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 support the Research Station at Jungfrauoch 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 Jungfrauoch we are particularly grateful to Mr. Andreas Wyss, chief of technical services and maintenance, and his team, and to Mr. Fritz Jost, chief Zugförderung und Werkstätte (ZfW). 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 Jungfrauoch 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 (Prof. Gianni Tofani, Dr. Filippo Mannucci), the I. Physikalisches Institut der Universität zu Köln (Prof. Juergen Stutzki, Dr. Martin Miller), of the University of Bern, and of all collaborating institutions. We are also grateful to the scientists of the Versuchsanstalt für Wasserbau, Hydrologie und Glaziologie (VAW) of the Swiss Federal Institute of Technology in Zurich (ETHZ). We then thank the Brig-Visp-Zermatt Bahn (BVZ Holding AG) and, in particular, the Gornergrat Bahn with its president of the board, Mr. René Bayard. The substantial continuous support provided by the Gornergrat Bahn, by its Chief Executive Officer Hans-Rudolf Mooser as well as the entire crew, has been essential for the success of the scientific work. During the construction work we appreciated the good collaboration with all those involved, in particular with Mr. Kurt Haene, project manager, Mr. Pierre Gurtner, architect, Mr. Paul-Marc Petrig, Mr. Gerhard Mooser, and Mr. Roland Julen. We thank them for their commitment to make the impossible possible. 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 and his unlimited patience in struggling with an increasing number of obstacles (i.e. firewalls) affecting free flow of scientific data. 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 is most gratefully acknowledged. But her kindness in the daily contacts with staff and scientists is equally appreciated. It is indeed the combination of professional competence and human touch that make her so unique and so precious for the Foundation.



Bern, February 25, 2006

Erwin O. Flückiger

