Ev–K^2–CNR

Prof. **Ardito Desio** Leader

Dr. **Ugo Savardi** Scientific Coordinator

SPEDIZIONE 1989
RELAZIONE PRELIMINARE

1989 EXPEDITION
PRELIMINARY REPORT

SCIENTIFIC RESEARCH CONDUCTED IN NEPAL DURING THE 1989 Ev-K2-CNR EXPEDITION

Prof. A. Desio

The scientific research programme of the Ev-K2-CNR scientific expedition was originally limited to a series of geodetic-geophysical and geological projects to be carried out in the area of Mount Everest and in the Tibetan territory situated to the north. The programme was in effect similar to that undertaken the year before on the northern slope of the Karakoram range and in Xinjiang. At a certain stage, however, a large glass and aluminium pyramid to be erected on Mount Everest to house the scientific laboratories required for conducting a series of interdisciplinary research projects was offered to the expedition by a number of companies forming part of the EFIM group. The scope of the original programme was therefore considerably broadened by the addition of high-altitude research, principally of a biological and medical-cum-physiological nature, accompanied by the necessary technical and scientific apparatus and by a much larger group of researchers.

In February 1989, Prof. Desio met with a delegation of the Chinese Academy of Science (CAS) in Beijing and concluded the initial agreements on scientific cooperation. In April, a delegation of the Academy came to Italy and signed in Rome a three-year cooperation agreement with the Italian National Research Council (CNR).

In May, everything was ready for the transfer of the pyramid-laboratory and the researchers to Tibet, on the northern slope of Mount Everest, at an altitude of 5000 metres, when an absolutely unpredictable event took place: the student demonstrations in Tien An Men Square, which led to the interruption of official relations between China and the rest of the world.

After days of hectic consultation with scientific and logistic operators, Prof. Desio decided to transfer the entire expedition organization from the northern, Tibetan, slope of Mount Everest to the southern, Nepalese, side.

The legal and logistic problems to be solved at this

point became very complicated, including those linked with the difference in the climatic conditions on the two slopes of the Himalayas.

The base camp was set up near the mountain meadow of Lobuche, on the right side of the Khumbu glacier at an altitude of 4500 metres. Five laboratory tents and a rudimentary local structure housed about thirty researchers assisted by 5 guides and supported by 3000 kg of technical and scientific apparatus.

On August 15th, the researchers began to leave Italy for Nepal. After nearly two months of hard work at high altitude, they finished their research programmes and returned to Italy. The expedition was concluded by mid-October with the return of the last logistical operators.

Although the events related considerably complicated the organization and management of the expedition, the research conducted by the 26 scientists, two of whom were Nepalese, assisted by seven guides and by the logistics organizer Agostino Da Polenza and the scientific coordinator Ugo Savardi, covered the entire programme set for the 1989 expedition.

The following is a short outline report on the composition of the various scientific groups and the summary results of the scientific research conducted.

As a footnote, it may be noted that four of the mountain guides accompanying the expedition also found the time to climb Mount Pumori (7145 metres) by a new route.

EARTH SCIENCES

GEODESY - GEOPHYSICS - TOPOGRAPHY

Head: Alessandro Caporali*

As regards Geophysics, a gravimetric and geomagnetic profile was prepared having as its extremities the Terai plain, on the border between Nepal and India, and Lamagabar in the Tamba Kosi Valley, near the Chinese border, beyond which it was not possible to proceed.

The topographical research led to the identification of the data points of the Nepalese geodectic-topographical grid and the completion of a small traverse survey in the Kodari area, on the Tibetan border, with the erection of three steel and concrete pillars, which can be connected to the geodetic grids of Nepal and Tibet.

Because of bad weather, it was not possible to carry out a new measurement of the height of Mount Everest.

Institutions involved: *Dept. of Physics of the University of Padova; Dept. of Mathematical Sciences of the University of Trieste.

GEOLOGY

Geological research consisted of two different programmes:

CRISTALLINE GEOLOGY

Head: Ugo Pognante*

The researchers were active in the field for 25 days in the Khumbu Valley (Nepal). The structural and petrographic features of metamorphic paragenesis, the processes of migmatization and the relationships between Tertiary leucogranites and adjacent rocks were analyzed.

*Institutions involved: *Dept. of Earth Sciences of the University of Torino.*

SEDIMENTARY GEOLOGY

*Head: Maurizio Gaetani**

The expedition operated in Nepal in the Kali Gandaki Valley with the object of studying the stratigraphic sequence outcropping north of the Upper Himalaya range. 161 samples were collected and their analysis, in thin slices, has allowed the detailed reconstruction of the evolution in time of the sedimentary environments and the deposits of continental origin, from the Noric to the Aptian, in relation to the geodynamic events that affected the Indian edge of the Sea of Thetis.

*Institutions involved: *Dept. of Earth Sciences of the University of Milano.*

ENVIRONMENTAL SCIENCES

METEOROLOGY - HYDROCHEMISTRY - ATMOSPHERIC POLLUTION

For the three research programmes, the operators made use of the scientific apparatus available at the Lobuche base camp.

METEOROLOGY

Head: Salvatore Giannoccolo*

A meteorological station was installed by the personnel of ITAV Unit, allowing the acquisition of meteorological data and the preparation of weather forecasts. A study was also conducted with measurements and samplings of ground temperature and solar radiation.

Institutions involved: *3rd ITAV Unit.

ATMOSPHERIC POLLUTION AND HYDROCHEMISTRY

Head: Gianni Tartari*, Sandro Fuzzi**, Ivo Allegrini***

This programme was an attempt to evaluate the role of the atmosphere in the long-distance propagation of polluting agents by analyzing the concentrations of the main inorganic constituents, in addition to pH and conductivity values, in deposited moisture, lake environments, snow covering and cloud droplets.

The results obtained indicate that in the area concerned there is no local pollution and the presence of polluting agents is negligible. In part, this is due to the circumstance that, in the period covered by the observations, the incoming air masses were from the south-west, i.e from an area in which there is no specific activity of human origin.

*Institutions involved: *Applied Hydrobiology Unit of the Water Research Institute (IRSA-CNR) - Brugherio (MI); **Institute for the Study of the Physics of the Lower and Upper Atmosphere (FISBAT-CNR) - Bologna; ***Institute of Atmospheric Pollution - CNR of Roma.*

BIOLOGICAL SCIENCES

PHYSIOLOGY

Head: Paolo Cerretelli*

The research programme was designed to study the modifications in the lactacid/alactacid anaerobic metabolism as well as muscular fatigue during chronic hypoxia exposure. The studies were conducted at the Lobuche base camp on 6 members of the expedition forming part of the group of researchers. In general, it was concluded that among the factors limiting muscular performance at high altitude, anaerobic glycolysis plays a particularly important role, because of the deficit in the proton buffer mechanisms, produced by the dissociation of the lactic acid, with conseguent precocious inhibition of the glycolytic enzimes. Breathing O_2 has the effect of reducing the contribution of anaerobic glycolysis to the energy balance, while the administration of $NaHCO_3$ facilitates proton buffering, allowing anaerobic glycolysis to continue for a longer period of time, thus retarding exhaustion.

Institutions involved: *Institute of Advanced Biomedical Technologies (ITBA-CNR) - Milano; *Dept. of Physiology of the University of Geneva.

MEDICINE

Head: Silvio Porcù

The scientific protocol had three different aims to study the effects of high altitude hypoxia on central nervous system, on hydrosaline balance, and on the system of immunity.

As far as the first reseearch is concerned, 19 subjects had to fill out some questionnaires on sleep during the whole expedition; on other 9 subjects have been carried out some poligraphic records and of the space/temporal maps. This in order to identifie precise neurophysiological correlated in the acclimatization process to high altitude.

The second research has been carried out over 6 subjects and concerned the following tests: taking of blood sample,

urines, arterial pressure and electrocardiogram, with the purpose of trying to explain the pathological reasons of disturbs caused by the hydrosaline balance alteration.

The third one aimed to learn possible high altitude negative effects on the system of immunity answer to antigenic stimulus, has been carried out on 18 subjects exposed to a antimeningococcus vaccination, with taking of serum for the immuno-enzimatic survey.

Institutions involved: A. M. DASRS Medical Centre

BOTANY

*Head: Alcide Bertani**

The activity undertaken in the Khumbu Valley (Nepal), concerned the constant germination test, the gathering of locally cultivated vegetable material, and a typological study of local cultivation activity. The germination test, conducted in a little fridge at 20 degrees on about 50 species belonging to 11 different families of horticultural plants and cereals brought from Italy and on a dozen species collected during the approach to the base camp, demonstrated with greater precision than in the Milan laboratory the differences in the germination speed of the various families. As regards cultivated plants, they can be grouped (with a few exceptions, including potatos) into 3 families (graminaceae, leguminosae, cruciferae) that confirm the observations carried out on the most easily germinating seeds. Maize is cultivated up to about 2800-3000 metres, barley (to produce seed) at about 3400-3800 metres, and potatoes up to 4500 metres.

*Institutions involved: *Institute of Vegetable Biosynthesis - CNR Milano.*

ZOOLOGY

*Head: Sandro Lovari**

The aim of the research conducted was to ascertain the presence of species of wild ungulate mammals in the Sagarmatha National Park, in the Mount Everest area, and determine distribution, density and other population parameters. During the 22 days spent in the field, it was demonstrated that the most common wild ungulate is the Himalayan Thar (Hemitragus jemlahicus) with an altitude distribution varying between 2770 and 3500 metres approximately. The highest density area is situated between Pangboche and Phortse, on the south-western slope (27 thars/sq km). The size of the herds was also found

to be greater in this area than in the nearby area between Phortse and Khumjung, where the thar is also fairly common. The annual reproduction rate was very low everywhere, despite the fact that the observations were made at the end of the monsoon season, that is immediately after the birth of the young. It is possible that the low reproduction rate was influenced by the heavier snow fall during the winter of 1988/89 as compared with the norm, through the weakening of the pregnant females with consequent reabsorption of the fetus and miscarriage. A map was prepared showing the distribution of the thar in the park territory. There would appear to be no less than 200-400 individuals in a phase of geographical expansion.

*Institutions involved: *Dept. of Cellular Biology of the University of Camerino (MC).*

HUMAN SCIENCES

ETHNOGRAPHY AND HUMAN GEOGRAPHY

Head: Hildegard Diemberger*

A study was conducted in the Barun (Makalu) Valley with the aim of identifying, through the examination of documents and oral traditions, the area of the ancient Beyul Khenbalung (the valley concealed by wormwood), a mountanous region to the east of Khumbu. The members of the expedition were able to participate in various holy rites at the community of Sepa and to document the religious syncretism of that population among whom Lamaistic Buddhism still survives alongside the pre-buddhist Bon cult. The lamas actually cooperate and celebrate rites with the laven priests, who are concerned, in particular, with the territorial and clan divinities, a situation that has not been observed among other ethnic groups but that is mentioned in ancient Tibetan texts. The ancient lines of communication connecting the Arun Valley with Solu-Khumbu were also reconstructed. As it was too late in the season to follow the highest trail, already snow-bound, two members of the expedition followed a lower route taking them, in an 8-day march, from the village of Navgaon to Lukla. The Tibetan sector of this line of communication, trade and pilgrimage may presumably be explored from that side in the 1990 expedition due to the current impossibility of crossing the border line between Nepal and Tibet that today divides a region once politically and culturally united.

Institutions involved: *Institut fur Tibetologie of Wien.