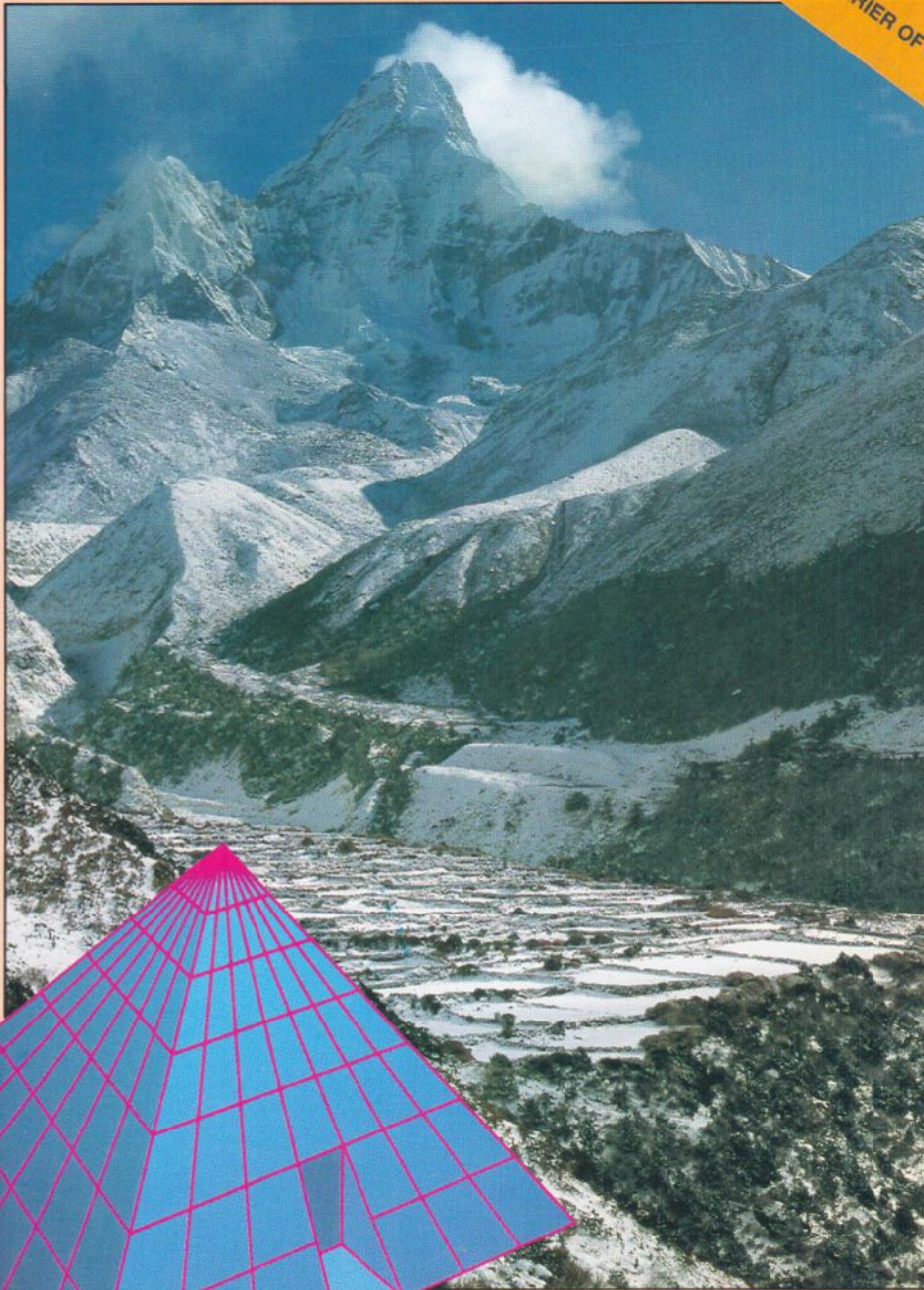


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OFFICIAL CARRIER OF EV-K-CNR EXPEDITIONS

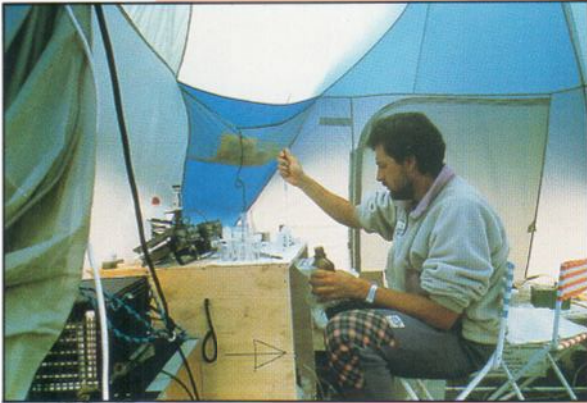
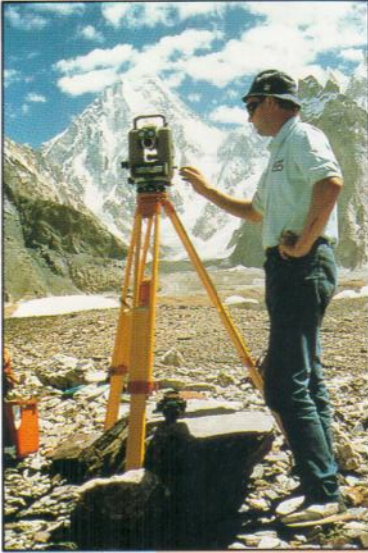


Ev-K²-CNR

ITALIAN NATIONAL RESEARCH COUNCIL

**Scientific and Technological Research
in the Himalayas and Karakorum**

WITH PATRONAGE OF:
MINISTRY OF UNIVERSITY, SCIENTIFIC AND TECHNOLOGIC RESEARCH
MINISTRY OF FOREIGN AFFAIRS



Ev-K²-CNR EXPEDITIONS

THE BIRTH OF PROJECT «PYRAMID»

The three expeditions so far in Central Asia in 1987, 1988 and 1989, so far identified by the code name Ev-K²-CNR, were prompted by a sensational announcement in the U.S.A. press, to the effect that K² is 11 meters higher than Mount Everest. An American scientist had in fact measured K² with modern surveying equipment during a mountaineering expedition on the northern (Tibetan) slope of K².

Professor Ardito Desio, who organized and directed the expedition, which first climbed this mountain in 1954, proposed to test the height from the southern slope not only of K², but of Mount Everest as well, using the same instruments and during the same period of time.

Thanks to the financial backing provided by the Italian National Research Council, under the presidency of Professor Luigi Rossi Bernardi, and to the effective collaboration of two well-known mountaineers, Agostino Da Polenza and Renato Moro, who dealt with logistics, and Alessandro Caporali of the University of Padova, who handled the scientific and operational aspects, the expedition was organized in just one month while the actual measurements took one month more. The results confirmed that Mount Everest was indeed the world's highest mountain.

These initial operations provided the opportunity and were the starting point for further checks and research work in the geodetic, geophysical and geological fields in those areas.

At first it had been thought best to conduct investigations in the same year, starting from the Mount Everest area and going on from there to K². But, considering the extension of the area and the obvious logistical problems arising from this, the programme was spread over two years, 1988 being dedicated to K² and 1989 to Mount Everest.

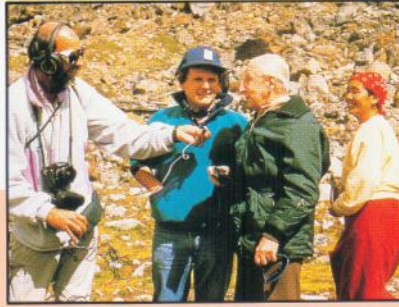
The 1988 expedition, which was made up of 18 members and included scientists, technicians and guides, was assigned a twofold task: on the one hand, the geodetic and geophysical measurements coordinated by Professor Caporali and, on the other hand, geological research conducted by the team of Professor Maurizio Gaetani, of the University of Milano.

The area chosen was mainly the middle Shaksgam Valley on the northern slope of the Karakorum, which had been explored for the first time by Professor Desio during the Duke of Spoleto's expedition in 1929, and the territory situated further north, as far as Kun Lun, in the Chinese region of Xinjiang.

Geophysical measurements mainly consisted of gravimetric measurements, while geological research was aimed at securing fresh data on an area which was subject to upheaval as a consequence of collisions between the Indian and Asian tectonic plates.

Altimetric measurements of the 8.000 m summits were seriously hampered by adverse weather conditions. Due to the complexity of the programmes of the two expeditions, it became necessary, among other things, to set up a control structure. At this stage a new and unexpected circumstance arose. Two companies forming part of the EFIM Industrial group, Alumix and Siv, donated a prefabricated glass and aluminium pyramid-shaped structure to be used as a shelter and house the scientific laboratories. The «Pyramid», as it was promptly nicknamed, led Professor Desio to extend the scope of the project to include such sciences as meteorology, hydrology, medicine, ethnography, zoology, botany, which could benefit most from a permanent high-altitude laboratory.

Originally, the new expedition was planned to take place on the northern, Tibetan, slope of Mount Everest and the backing and collaboration of the Chinese authorities was therefore necessary. Professor Desio flew to Peking to draw up a preliminary agreement, and a Chinese delegation came to Milano for the inauguration of the pyramid at the Milano Fair in April 1989. The final step was the signing of a protocol for a three-year scientific collaboration project between the Italian National Research Council (CNR) and the Chinese Academy of Sciences (CAS). All was ready for transporting several dozen tons of equipment, gear and in-



struments to Peking by sea and from there overland to the base camp on Mount Everest (Chomolungma, Tibet) at an altitude of about 5.000 m, when an unexpected event occurred: the demonstrations in Tien An Men Square shut off China from the outside world for the time being and virtually paralyzed our expedition from its very outset.

After days of feverish consultations, Professor Desio decided to shift the entire base of operations of the expedition from the northern (Tibetan) slope to the southern (Nepalese) slope of Mount Everest.

The logistic problems were enormous, in part because Nepalese summers are subject to monsoons and weather conditions were therefore different from those prevailing in Tibet. It was therefore necessary to be without the pyramid, which was left behind in Italy, and use conventional tents instead.

What Mountain Equipe and Agostino Da Polenza managed to achieve was just sort of a miracle: they set up a base camp at 4.950 m which was operational by early June 1989. The location chosen, transformed into a little scientific village serving as headquarter for the different teams of researchers, was the mountain pasture of Lobuche, situated on a morainic shelf to the right-hand of the Khumbu glacier. Five laboratory-tents and a rough local construction housed the 30 researchers, the 5 guides who assisted them, and over 3.000 kgs of scientific equipment.

EV-K²-CNR, THE FIRST HIGH-ALTITUDE SCIENTIFIC LABORATORY

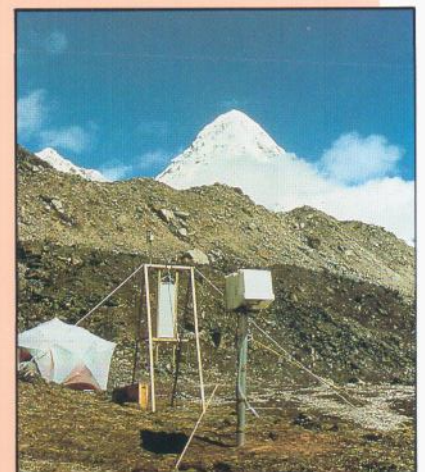
The new expedition of summer of 1990 is therefore a remake of the initial project and proposes the installation of the first semi-permanent high-altitude laboratory, designed as a base for scientists conducting research work in the Himalayan region.

The persistence of political unrest in Tibet and its effects on scientific operations conducted in that territory controlled by the Chinese authorities, led to the final decision to install the pyramid in Nepal, on the southern slope of the Himalayas. The 1989 expedition had already provided the opportunity to establish a good working relationship between the Ev-K²-CNR Committee and the Royal Nepalese Academy of Science and Technology (RONAST).

The pyramid has been installed at an altitude of 5.050 m in the Sagarmatha (the Nepalese name for Mount Everest) National Park, close to a glacier lake just above the mountain pasture of Lobuche. Many logistic difficulties have been overcome to carry out this operation. For instance, the site chosen is about 100 km from Jiri, the closest village, linked to Kathmandu by a motor road, while the rest of the way must be covered by foot in a dozen stages. The pyramid is completely self-sufficient power-wise. All the power required to operate the different equipment and scientific apparatus is in fact supplied by a hydroelectric power plant and a photovoltaic system.

The best waste disposal systems are available, not only to cover the needs of the base camp, but also to handle refuse left by mountaineering expeditions and by the over 5.000 m trekkers who each year head for Lobuche, Gorak Shep and, especially, the base camp at Mount Everest, one day's march away.

The Ev-K²-CNR project falls in with the purposes of the Sagarmatha National Park and includes teams of researchers working in the scientific fields down here listed.



GENERAL RESEARCH PROGRAMME OF THE Ev-K²-CNR SCIENTIFIC EXPEDITIONS

The Scientific Committee, presided over by Prof. Ardito Desio, plans from year to year the research activities of Ev-K²-CNR scientific expeditions. They are divided into four broad areas: Earth Sciences, Environmental Sciences, Biological Sciences and Human Sciences.

EARTH SCIENCES - The projects which, owing to the itinerant nature of their work and for their specific scientific interests, will be carried out in Nepal and in Karakorum, away from the pyramid structure.

Geodesy - Geophysics - Topography: Geodetic, Geomagnetic and land surveys in the areas of the Karakorum, Hindu Kush in Pakistan and different areas of Nepal as far as the upper Himalayas.

Universities and Organisations involved: Department of Physics of the University of Padova; Department of Mathematical Sciences and Department of Mines and Applied Geophysics of the University of Trieste; Department of Geophysics of the University of Udine.

Geology of Sedimentary Rocks: I - The relationship between the geological formations of the Tibetan, the Karakorum and the Himalayan plateau; **II** - Formations from the Permian to the Cretaceous on the northern boundary of the Indian tectonic plate.

Universities and Organisations involved: Department of Earth Sciences of the University of Milano.

Geology and Petrology of Crystalline Rocks: Geology and Petrology of granitoid and metamorphic rocks on the southern slope of the Himalayas across Mount Everest.

Universities and Organisations involved: Department of Earth Sciences of the University of Torino and of the University of Pisa.

Geology of the Quaternary and Geomorphology: Survey of some upper Karakorum valleys.

Universities and Organisations involved: Department of Earth Sciences of the University of Milano; Civic Museum of Natural Sciences of Brescia.

ENVIRONMENTAL SCIENCES - Four operators are carrying out programmes availing themselves of equipment set up in the Pyramid and in stations located at higher altitudes.

Hydrochemistry: Investigation on the hydrochemical characteristics of atmospheric deposits.

Universities and Organisations involved: Department of Applied Hydrobiology of the Water Research Institute (IRSA - CNR) of Brugherio (Milano).

Atmospheric pollution: Research on the chemical characteristics of cloud droplets, the turbidity characteristics of the upper troposphere, hydrometeors and aerosols.

Universities and Organisations involved: Institute for the Study of Physical and Chemical Phenomena of the Upper and Lower Atmosphere (FISBAT - CNR) of Bologna.

The Pyramid is a structure with a base measuring about 187 square metres and a height of 8.5 metres, with a number of rooms spread over three floors. The research equipment is located on the ground floor. Accommodation for 28 people, including researchers, technicians, organizers and mountaineers, is provided on the second floor. The third floor houses equipment for radio and telephone communications via satellite.

MAIN LOADS CONSIDERED

Wind speed: 150 km/h.

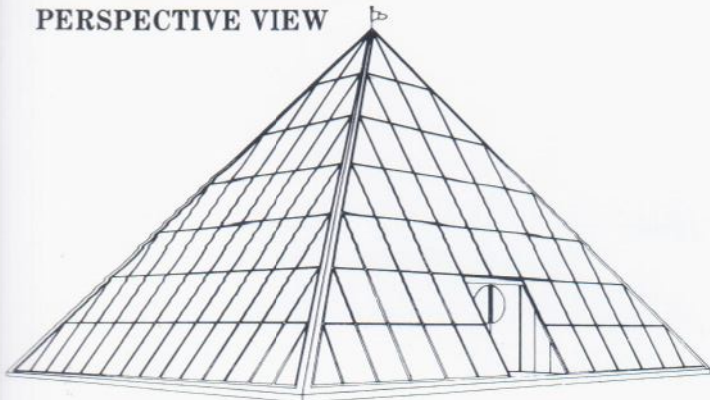
The snow load is considered negligible due to the particular inclination of the sloping sides (51,08°), but an overload of 100 kg/m² has been calculated for the glass walls.

DIMENSIONS

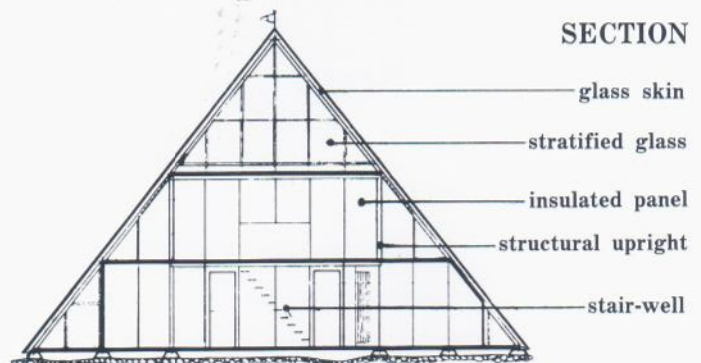
- Side of the pyramid 1322 cm
- Height of the pyramid 840 cm
- Angle at the base 51,08°

The proportions of the pyramid match those of the Egyptian pyramids, though on a smaller scale (golden section).

PERSPECTIVE VIEW



SECTION



POWER GENERATION

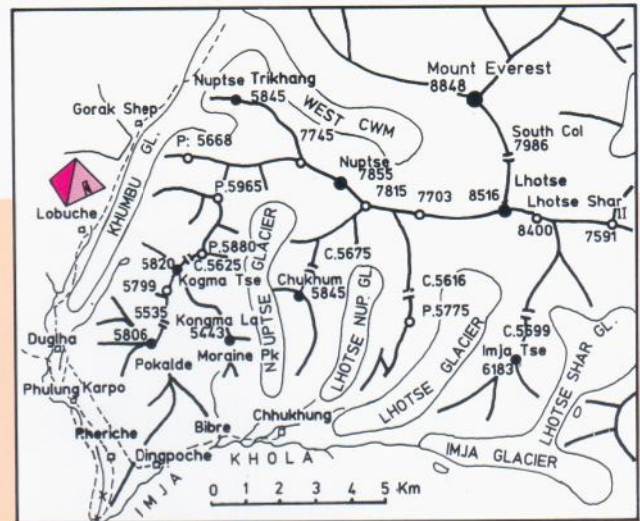
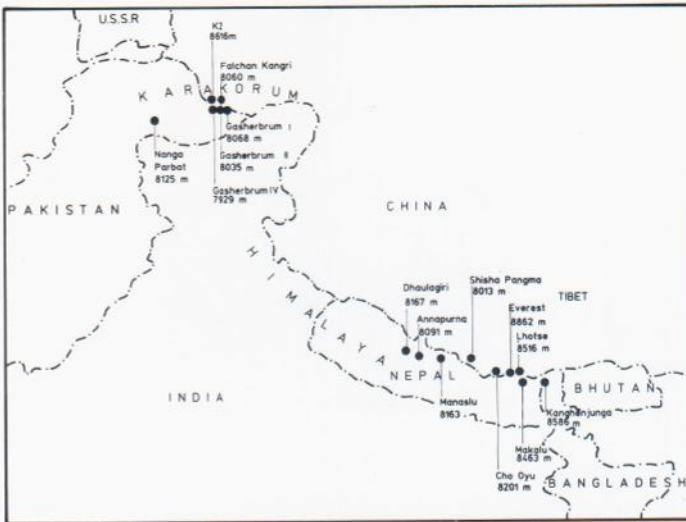
Two plants for the generation of electric power have been built.

Photovoltaic plant

- High-performance cells 66 (50 W per cell)
- Peak powers produced 3 KW

Microhydraulic power plant

- Turbine 10 W
- Type of power generated electric and thermal
- Net waterfall 60 m
- Power supplied 6 KW



BIOLOGICAL SCIENCES - Eight research programmes are in progress. Except for the zoologists, who will be carrying out a number of surveys in Dolpo (eastern Nepal), the other scientists are working in the pyramid's own laboratories.

Human Factor: Investigations will be conducted on modifications of the cerebral functions as a consequence of hypoxia at high altitudes.

Universities and Organisations involved: Department of General Psychology of the University of Padova, Neurophysiological Unit of the Department of Neurology, and Psychosocial Rehabilitation Unit of the Treviso Regional Hospital.

Physiology: Bioenergetics in muscular activity at high altitude.

Universities and Organisations involved: Institute of Advanced Biomedical Technologies (ITBA - CNR) of Milano; Department of Physiology, University of Geneva.

Cardiology: Structural modifications and cardiac functions during and after high-altitude acclimation.

Universities and Organisations involved: Department of Cardiology and III Chair of Special Medical Pathology and Clinical Methodology of the University of Padova.

Nutritional Sciences: Nutritional problems at high altitudes.

Universities and Organisations involved: Physiological Chemistry Institute, Gutenberg University, Mainz; German Research Association.

Zoology: I - Surveys of the fauna in the Dolpo region; II - Distribution and situation of the Himalayan Thar in the Sagarmatha National Park.

Universities and Organisations involved: Department of Cellular Biology of the University of Camerino (Macerata); Department of Physiology and General Biology of the University of Parma; Institute of Biology of the University of Siena; National Institute of Wildlife Biology of Ozzano Emilia (Bologna).

Botany: I - Biochemical and physiological adaptation of plants growth at high altitudes, II - Vegetation in the Khumbu Valley.

Universities and Organisations involved: Institute of Vegetal Biosynthesis of Milano-CNR; Institute of Botany of the University of Pavia; Department of Biology of the University of Bologna.

HUMAN SCIENCES - A research programme is to be conducted by operators doing field work in northern Nepal, concerning the material and spiritual culture of the populations of the Beyul Khembalung, in the east and south of Everest and Makalu area.

Universities and Organisations involved: Istitute for Middle and Far East (ISMEO) of Milano; Institute for Volkerkunde, University of Wien.

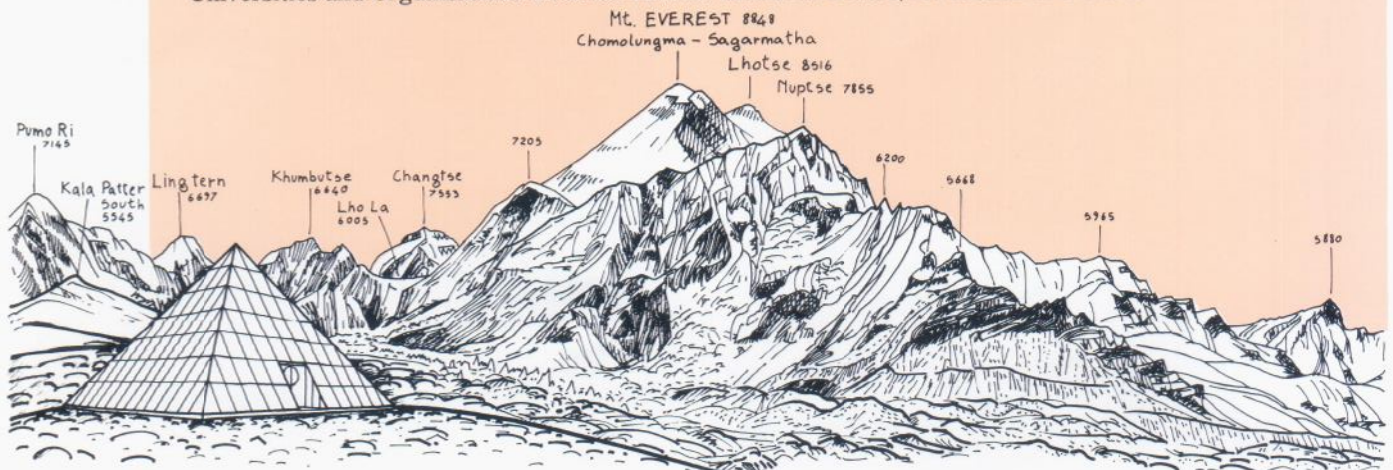
TECHNOLOGICAL RESEARCH - All operations performed by the technical collaborators of the Ev-K²-CNR programme are aimed at collecting data and gaining experience on the use and running of material and equipment used and tested in the pyramid-laboratory at 5050 m.


Power: rating of advanced solar photovoltaic cells. Monitoring of the conventional electric power generating systems at high altitudes under critical environmental situations.

Universities and Organisations involved: Cise - Tecnologie Innovative.

Material: study and monitoring of innovative technical solutions for the manufacture and installation of the aluminium and glass structure of the Pyramid-laboratory.

Universities and Organisations involved: Alumix Research Centre; Siv Research Centre.





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THE OPERATIVE MANAGEMENT OF THE Ev-K²-CNR PROJECT IS ENTRUSTED TO MOUNTAIN EQUIPE SRL
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