United Nations Educational,
Scientific and Cultural Organization

The International Year of Mountains, *p. 2*

A World of SCIENCE

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EDITORIAL

Feet on the ground, head in the clouds

Mountains are extraordinary. Who could not marvel at the sight of giraffes grazing against the backdrop of snow-capped Kilimanjaro in Tanzania or at the Atlas mountains surging out of the Moroccan desert?

We admire their beauty but how conscious are we of the essential role mountains play in regulating the Earth's climate and energy balance, in recording Earth's history and in supplying us with freshwater and much of the world's remaining genetic diversity, including precious crop genes? Mountains have been called 'the water towers of the world'; they are the source of water for more than half the world's population and the origin of all the world's major rivers.

Majestic they may be, but mountains also harbour fragile ecosystems. Their often thin soil layers erode easily, limiting plant growth and making mountains vulnerable to human disturbance. Mountains also have a long history of economic exploitation and political neglect.

Global climate change is now posing new threats, causing glaciers to melt at unprecedented rates and increasing the frequency of natural catastrophes with their heavy human and economic toll.

As we shall see in this issue, there is obvious call for concern, both in terms of the biophysical environment of mountains and the deteriorating living conditions of their 500 million human inhabitants.

It was in order to foster awareness of the importance of mountains and sustainable mountain development that the United Nations designated 2002 as International Year of Mountains.

The highlight of the Year for UNESCO has undoubtedly been the launch of a global climate change monitoring programme with several of the Organization's major research partners and involving UNESCO's mountain biosphere reserves. Through this important project, UNESCO will be setting up monitoring stations in 'sample' biosphere reserves to collect data on the effects of climate warming on some of the most diverse of Earth's ecosystems.

W. Erdelen
Assistant Director-General for Natural Sciences

The International Year of

UNESCO's main contribution to the International Year of Mountains, which ended in December, is a new climate change monitoring programme in mountain biosphere reserves.

In partnership with the Mountain Research Initiative (MRI) based in Berne (Switzerland), International Human Dimensions Programme on Global Environmental Change (IHDP), International Geosphere–Biosphere Programme (IGBP) and Global Terrestrial Observing System (GTOS), UNESCO is selecting biosphere reserve sites from each of the major mountainous regions of the world as the focus for the global climate change monitoring programme. In addition to assessing environmental impacts, the study will look at how global change is affecting the socio-economic conditions of mountain dwellers.

The Director-General of UNESCO, Koïchiro Matsuura, announced the initiative on 29 October at the Global Mountain Summit in Bishkek.

Some 140 of UNESCO's biosphere reserves are situated in mountains. These offer a major advantage for global comparisons. Their so-called 'core' areas are relatively free of human activity (see p. 8). Outside these core areas, the culture and farming practices of mountain people can have profound effects on local ecology, making the effects of climate change difficult to distinguish from those directly due to human activities. Even the German word 'Alp' refers to mountain pastures reclaimed from naturally forested areas or areas above the timberline. 'And', says Bruno Messerli of the University of Berne, who is participating in the programme within the MRI, 'the structure of mountain biosphere reserves makes them ideal natural laboratories for investigating highland–lowland interrelationships.'

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The idea of using biosphere reserves in mountain areas for global change research would be an extension of the Global Observation Research Initiative in Alpine Environments (GLORIA) project, an international research network that is looking at the effects of global change on alpine vegetation by making standardized observations in parallel sites[2]. GLORIA has already launched research in mountain sites in Europe and is now looking to extend the work globally. 'It is a unique opportunity to have access to biosphere reserves in all the big mountain areas of the world,' comments Messerli.

2. www.gloria.ac.at/res/gloria_home/

From Rio to Bishkek

When 2002 was designated International Year of Mountains by the United Nations, UNESCO, UNEP and UNDP were invited to collaborate with the lead agency for the Year, FAO, on promoting the sustainable development of mountains with governments and NGOs.

The International Year of Mountains is not a flash in the pan but rather part of an on-going process within the United Nations.

That process began in 1992 at the United Nations Conference on Environment and Development, more familiarly known as the Rio Conference. One of the key agreements adopted by governments in Rio was *Agenda 21*, with its Chapter 13 entitled 'Managing fragile ecosystems: sustainable mountain development'. The chapter calls for establishing programmes to generate and strengthen knowledge about the ecology and sustainable development of mountain ecosystems and to promote integrated watershed development and alternative livelihood opportunities.

Since Rio, UNESCO has been energetically promoting the cause of sustainable development, including that of mountain regions[2]. It is an active partner within the Inter-agency Group on Mountains, which includes FAO, UNEP and the United Nations University (UNU).

© T. Schaaf/UNESCO

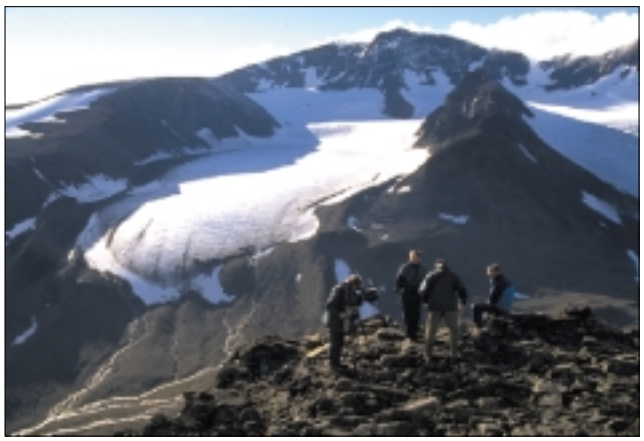
Traditional hunters with their eagles, Issyk Kul Biosphere Reserve, Kyrgyzstan

The culminating event of the International Year of Mountains was the Bishkek Global Mountain Summit in Kyrgyzstan from 29 October to 1 November, which attracted 700 participants from 82 countries. The Bishkek Platform adopted at the Summit invites the International Year of Mountains Focus Group of the United Nations to develop a resolution on sustainable development in mountain regions. It also invites the scientific community and its funding agencies to promote research, monitoring and early warning systems that focus on both the biophysical and socio-economic aspects of sustainable development in mountains.

For further information, go to: www.mountains2002.org, www.unesco.org/mab/IYM.htm *or* www.globalmountainsummit.org

1. See UNESCO in the Mountains of the World *(CD-ROM): http://valhalla.unep-wcmc.org/unesco/index.htm*

Mountains



© Photo: W. Haeberli

The glacier Storglaciaren with Kebnekaise, the highest mountain in Sweden, in the background; extensive studies of glacier changes and flow form the basis for glacier models which can then be applied to climate impact studies

Mountain ecosystems are well suited to tracking global climate change. 'The upper ecosystem from the upper vegetation limit to the glacier is essentially the same over all climatic zones from the poles to the inner tropics,' adds Messerli. 'A glacier and the permafrost on Kilimanjaro are the same as in the Alps or the Himalayas.'

At the same time, mountain ecosystems change dramatically over very short distances, with only small changes in altitude. This makes them particularly useful indicators. For example, at higher altitudes only certain plant and animal species can survive under long periods of snow and ice cover. With global warming, these areas are shrinking; plants adapted to the warmer, lower habitats are slowly invading the higher elevations. The shifts in these ecosystem boundaries provide an index of global climate change which can be observed and compared on all continents of the world using standard sets of climatic measurements, such as precipitation and temperature. Other factors driving global change, like radiation, soil erosion, changing soil conditions and demographic pressures, are also very noticeable in mountain regions.

A glacier and the permafrost on Kilimanjaro are the same as in the Alps or the Himalayas.

Glaciers are disappearing before our eyes

The sensitivity of mountains to global climate change has gradually emerged over recent decades. But it first attracted wide public

Sacred sites: a natural ally of biodiversity conservation

Community-based sacred sites are increasingly being recognized as an important ally in conserving biodiversity. Religious sanctuaries and sacred places house the gods of village communities, making them taboo to human trespass. In this way, they may protect species, groves or landscapes. This form of traditional resource management complements the more recent approaches to protected area management based on Western scientific knowledge.

UNESCO-MAB and the UNESCO World Heritage Centre are teaming up with the World Conservation Union (IUCN) to study culture-based environmental conservation, with a focus on mountain sites. The study will examine cultural practices which designate certain areas as sacred sites, within biosphere reserves, natural world heritage sites and non-protected areas.

One of the sites could be Xishuangbanna Biosphere Reserve where the local Dai people have developed particularly interesting cultural mechanisms for conserving the environment. The predominantly Buddhist Dai believe that the plants and animals inhabiting the Holy Hills are either companions of the gods or sacred beings living in the gods' garden. Hunting, wood-felling and food-gathering are strictly prohibited. The spirits of revered chiefs are also believed to live in the Holy Hills.

© Photo: Qiu Kaipei, Li Chunsheng

Elephants in Xishuangbanna Biosphere Reserve

A workshop to prepare the study is planned for 17–20 February 2003 in Kunming (China). The workshop will include a site visit to Xishuangbanna Biosphere Reserve.

For further information, contact:
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The Himalayas concentrate nine of the world's ten highest mountain peaks, all over 8000 m high. Formed by the collision of plates of the Earth's crust, mountains are naturally high-energy environments; the 'young' Himalayas are still rising, by about 1 cm a year.

A 'Type 2' Partnership for Sustainable Development in Mountain Regions

At the World Summit on Sustainable Development in September, UNESCO joined the International Partnership for Sustainable Development in Mountain Regions, a project involving numerous governments, IGOs, international institutions and private-sector partners. Other participating United Nations agencies are FAO, UNEP, UNDP and the UNU.

Various initiatives under the Partnership were discussed at the Bishkek Global Mountain Summit. 'We count on the continuing and increasing involvement of UNDP, UNESCO, UNU, other UN agencies, multilateral development banks, other international organizations and states [in the Partnership]', notes the Bishkek Mountain Platform.

Areas falling within UNESCO's mandate for this 'type 2' initiative are: promoting distance education to reach remote mountain centers; interdisciplinary research combining natural and social sciences to address problems faced by mountain populations; and preserving cultural heritage and biological diversity, including through support to sacred mountain sites (see p. 3).

For further information, go to:
www.unesco.org/mab/IYM.htm *or*
www.globalmountainsummit.org

attention in 2001 when Professor Lonnie Thompson of Ohio State University forecast that Mount Kilimanjaro (Tanzania) would lose its famous snow-capped peak by 2015 if current predictions on global warming were maintained. The mountain, he claimed, had already lost some 82% of its permafrost since 1912 and 33% of this in the past two decades. And, while the extra water from the melting glacier may be increasing the fertility of adjacent lowland areas in the short-term, water supplies would become critically low if the glacier disappeared.

A similar picture can be seen all over the world. All 37 named glaciers in the Glacier National Park in Montana (USA) have shrunk dramatically in the past 150 years, with the Sperry Glacier losing 11% of its volume between 1979–1993 and the Grinnell Glacier retreating by 63% between 1938 and 1993, according to the US Geological Survey, which predicts that all glaciers in the Park will be gone by 2030 if present warming rates continue.

Europe's Alps are not spared either. 'From 1850 to 1980, Alpine glaciers lost half their volume, on average,' says Messerli. 'And, in the 20 years to 2000, one-quarter of what was left was also lost. There will still be a bit of the 23 km Aletsch glacier left at the end of the century, because it is 900 m deep in places but a lot of other areas will disappear.' Rhone Glacier is another striking example.

© Photo: W. Haeberli

A lake formed by melting Belvedere Glacier threatened to flood the village of Macugnaga in Italy in 2002

Melting glaciers are causing water worries

UNEP is currently monitoring lakes that have formed as glaciers melt. In the Himalayas alone, some 44 glacier lakes are filling so rapidly that they could burst their debris retaining walls in the next four or five years, in what are known as 'glacial lake outburst floods'. While this type of flooding is not a new phenomenon, according to UNEP, there is evidence that they are becoming more common as glaciers retreat, putting in danger the towns and villages that lie beneath them.

In July, emergency workers pumped out a 16-hectare lake formed by the melting Belvedere Glacier on Monte Rosa in Italy when it threatened to burst the dyke of boulders that had been containing it and flood the Italian village of Macugnaga.

Glaciers melt naturally during the summer; the phenomenon is not, in itself, a sign of global warming. Under stable climatic conditions, the ice lost through melting is replenished by winter precipitation in the form of snow. And the melt water forms an essential part of many of the world's major rivers. 'But,' adds Mel Reasoner, Scientific Secretary of the MRI, 'in many arid and semi-arid areas, people are dependent not only on the amount of glacier melt water, but on the timing of the water flow. The water has to be available at critical times for irrigation. Snow-pack and glaciers provide a buffer between when the precipitation falls as snow and when it is released as water. The melt season is often the warmest, driest time of the year, providing large volumes of runoff for irrigation when it is most needed.'

The problem is that, in many of the world's mountains, there is less precipitation today in the form of snowfall, as winters have become shorter and warmer. Combined with warmer summer temperatures, this creates a net loss for the glacier, even if, in the short-term, the extra melt water is welcome in adjacent lowland areas. 'But,' warns Reasoner, 'where agriculture has become dependent on the seasonal melt water, if you remove the glacier you no longer have a source of stored water that is available throughout the summer.'

Photomontage by H. Holzhauser; historical photo: Gustave Dardel

Photomontage of the Rhone Glacier in 1849 (left) and 2002 (right)

Minimizing disaster risk in mountain areas

The number of weather-related disasters (droughts, floods and storms, for example) has doubled since 1996 even as the number of geophysical disasters (e.g. earthquakes and volcanic eruptions) has remained steady, according to the *World Disaster Report* (2001). If floods cause the most damage, earthquakes run a close second.

'Mountain areas are particularly prone to earthquakes', says Wolfgang Eder, Director of UNESCO's Earth Sciences Division, 'especially "young" mountains like the Alps, Andes and Himalayas, which are still moving.' A fault line stretches the whole length of them, making the Himalayas one of the most seismically active areas on Earth, with over 40 earthquakes measuring over magnitude 7 on the Richter scale between 1911 and 1991.

Mountain dwellers are particularly vulnerable to natural hazards. And global warming, coupled with changes in land use, such as deforestation or extensive terracing, is increasing this vulnerability. The heaviest rains for three decades brought floods and landslides to Nepal in July this year, killing some 187 people and cutting off the Kathmandu Valley from the rest of the country. And the collapse of the Kolka Glacier in the Caucasus Mountains in mid-September buried villages in the Republic of North Ossetia (Russian Federation) under thousands of tons of ice and rock, killing over 120 people. In January 2002, UNESCO helped to launch a Consortium on Landslides with a series of projects to mitigate risks.

Some of the world's most precious monuments are situated in mountainous areas prone to natural disasters.

Preventive measures can be taken to protect human life, such as using selected materials and practices for building and avoiding construction in flood-prone areas, but it is often impossible to protect historic monuments from damage.

According to Peter Laws, a consultant in the Asia Unit of the World Heritage Centre, one positive step would be to compile detailed records of monuments and treasures so that they can be reconstructed in the event of a disaster. Local authorities might also draw up a disaster action plan that could include briefing emergency services on how to limit the damage. 'It would be a pity to lose precious time rescuing stone statues from a flood when parchment manuscripts should be saved first,' says Laws.

Alongside experts, mayors from mountain cities around the world met in Chambéry (France) on 25–27 September to share experiences and explore areas for potential co-operation. The conference on World Heritage Mountain Cities and Natural Hazards was organized by UNESCO, the city of Chambéry and the latter's specially created Montanea Association.

UNESCO has been co-operating with Kyoto University's Disaster Prevention Research Institute since 1999 to protect cultural and natural heritage sites.

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© Photo: Disaster Prevention Research Institute, Kyoto University, Japan

The gigantic Mayuyama Landslide on Mount Unzen in Japan in 1992; the 200 million m³ of debris and induced tsunami killed 16,000 people

Promoting eco-tourism in mountains

2002 was also designated International Year of 'Eco-tourism', the aim of eco-tourism being to reconcile tourism development and environment.

The second-largest tourist destination worldwide, mountain regions are in the front line of tourism development. This is causing conflict in some regions, as *A shrinking ski season* explains.

Tropical mountain forests are proving to be the most vulnerable of all mountain ecosystems. They have the fastest rate of biodiversity loss at about 1.1% a year[3].

One of the sub-species most threatened is the mountain gorilla (*Gorilla beringei beringei*), which shares about 97% of its genes with humans. The Democratic Republic of the Congo (DRC, ex-Zaïre), Rwanda and Uganda are home to the last 350 mountain gorillas in the wild. Before the tragic events of the Rwandan genocide in 1994 and the war in the DRC, there was a flourishing eco-tourism industry in the Great Lakes region. Small numbers of admirers of mountain gorillas were brought to within a respectful distance to observe the primates without disturbing them. In the early 1990s, this eco-tourism netted the Institute of National Parks (ICCN) of the DRC as much as US$750,000 a year, thereby ensuring sufficient revenue to pay park rangers and other staff employed to protect the mountain gorillas.

It is hoped to revive this eco-tourism in the Great Lakes region through the new Great Apes Survival (GRASP) project. The participants in the first GRASP workshop, organized by UNEP, UNESCO, USAID, CARPE, Born Free, WWF and ICCN in Kinshasa (DRC) from 26–28 September 2002, strongly recommended creating a transboundary biosphere reserve involving the Volcanoes Biosphere Reserve (Rwanda) and the two World Heritage sites of the Virunga National Park (DRC) and Bwindi Forest (Uganda), to promote an ecosystem approach and contribute both to strengthening scientific co-operation and to peace-building in the region.

© International Gorilla Conservation Programme

Mountain gorillas in Virunga National Park, DRC

© P.Coles/UNESCO

Exposed to the elements and unguarded, the 5,000 boulders at Cholpon Ata feature hunters with bows and arrows, ibex and snow-leopards (as here), as well as horses, goats and even camels[4]

This year, UNESCO has also embarked upon a new project to promote Sustainable and Cultural Eco-tourism in Mountain Areas of Central Asia and the Himalayas. Throughout 2003 and 2004, UNESCO's Division of Cultural Heritage, in co-operation with the MAB programme, will be field-testing 'best practices' in eco-tourism at eight pilot sites, based on local community participation and initiatives. One of these sites is Cholpon Ata near Lake Issyk Kul in Kyrgyzstan. Every summer, large numbers of tourists visit petroglyphs (rock art) here from the Bronze and Iron Ages which are up to 4,000 years old.

For further information (on GRASP), contact:
s.mankoto@unesco.org,
or (on the Central Asian project):
f.childe@unesco.org

3. World Resources Institute (2000), World Resources 2000–2001, *annex on mountain ecology, p.134.*
4. The May 2003 edition of the New UNESCO Courier *will feature Cholpon Ata: unesco.courier@unesco.org*

A shrinking ski season

The sensitivity of mountains to global warming is also having an impact on local economies that depend on tourism. 'Below 1500 m, the ski stations in the Alps can no longer continue,' says Messerli. 'The ski lifts are closing. The big banks will no longer give loans for new ski industry constructions.' Reasoner confirms this. 'A lot of the low-elevation ski stations did not open this year and many are seeing a significant drop in revenue. If the winter snow-line moves up 1000 m in the next 100 years the ski industry is going to look very different to the way it does now. Already, ski areas are eying expansion into higher undeveloped areas in the Alps, which is meeting with stiff resistance from environmental groups. And this is creating conflict between interests that really should be working together.'

A lot of the low-elevation ski stations ... are seeing a significant drop in revenue.

Ski resorts in North America are reporting a similar decline. According to the World Resources Institute, a lack of snow could also threaten the future of the Winter Olympic Games. But it could simply mean that the Games move to northern venues, like Norway, where global warming has increased winter precipitation and where glaciers are growing – even if the winters are still getting shorter.

* * *

As the International Year of Mountains draws to a close, the climate change monitoring programme is gathering momentum. In 2003, some three or four mountain biosphere reserves will be selected for each of Africa, Asia, Latin America and Europe/North America as the subject of a comparative study. Monitoring stations will be set up in each of these reserves to collect the data. A 'scoping' workshop for the study is planned for the autumn at the Entlebuch Biosphere Reserve in Switzerland.

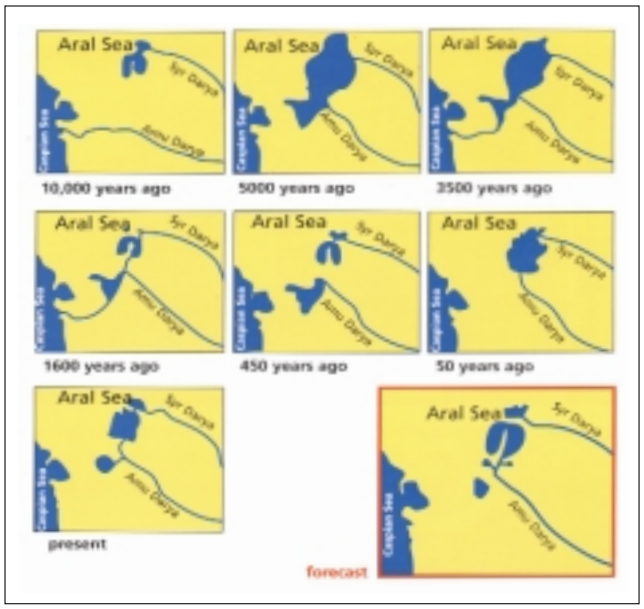
Peter Coles[5] and Thomas Schaaf[6]

For further information, go to:
www.unesco.org/mab/IYM.htm

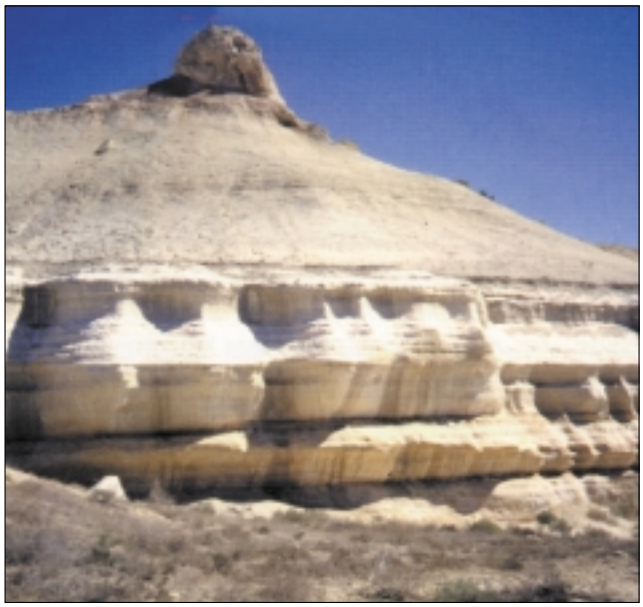
5. UNESCO Bureau of Public Information
6. UNESCO Programme Specialist

UNESCO to study **Aral Sea** Basin

The Director-General of UNESCO, Koïchiro Matsuura, announced the launch of a regional study of the Aral Sea Basin at an International Seminar on Freshwater in Dushanbe (Tajikistan) on 1 November.



The extent of the Aral Sea in previous eras (diagrams after ALADIN, Ecological Research and Monitoring of the Aral Sea Deltas; UNESCO, Paris, 1988)



© Ressl

Different water levels have left their mark on the steep western bank

The Aral Sea has become a synonym for ecological disaster, with its dramatic pictures of rusty boats lying in the sands of what used to be the fourth-largest lake on earth. In the 1960s, during the Soviet era, central authorities decided to divert unprecedented amounts of water from two rivers feeding the Aral, the Amu Darya and the Syr Darya, to irrigate huge new cotton plantations, primarily in Kazakhstan. By planting the single crop of cotton, they exhausted both freshwater supplies and the soil. But, instead of altering the policy, farmers were encouraged to use more water and dangerous amounts of pesticides and fertilizer.

Today, the Aral is about half its original size. The two main fishing ports are dry, stranded 10 km from the remaining water, which used to be brackish but is now extremely polluted and four times more saline. The lack of water has even upset the microclimate. Violent sandstorms regularly rip through the basin, carrying away an estimated 150,000 tons of salt and sand contaminated with pesticide residues each year.

Fishing and navigation have completely disappeared and agricultural yields have plummeted. The population also suffers from serious health problems primarily caused by toxic drinking and irrigation water.

UNESCO has been working with the concerned countries to study and improve conditions since 1992, through some 20 research projects involving more than 140 scientists from the region. In 1998, UNESCO created the Scientific Advisory Board for Aral Sea Basin Problems to explore options for the future. There have been longstanding plans to divert other rivers in order to restore the Aral Sea. Since such schemes could cause further ecological damage, UNESCO has focused on helping the national governments to manage the basin and co-ordinate their activities jointly in such key areas as agriculture and hydroelectricity to reinforce the fragile health of the entire basin.

The extensive study of the Aral Sea Basin will be conducted within the framework of the World Water Assessment Programme involving 23 United Nations agencies.

For further information, contact: j.bogardi@unesco.org

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Experimental plantation established by scientists on the dry sea bed

18 new sites added to World Network of **Biosphere Reserves**

Eighteen new sites in 12 countries have been added to UNESCO's World Network of Biosphere Reserves and a further five existing biosphere reserves have been extended.

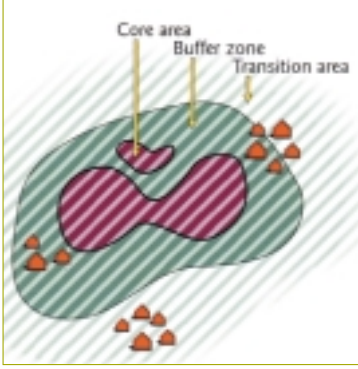
One of these extensions creates the first transboundary biosphere reserve in Africa.

The 'W' Region Transboundary Biosphere Reserve, as it is known, covers more than one million hectares in Benin, Burkina Faso and Niger. The fruit of strong political will on the part of the host countries, the site will serve as a model for experimenting with different strategies for sustainable development involving the participation of local communities. It marks the first concrete action by the Environment Initiative launched by the New Partnership for Africa's Development (NEPAD) at the World Summit on Sustainable Development in Johannesburg (South Africa).

The additions bring the number of sites to 425 in 95 countries. The new biosphere reserves and extensions were approved by the Bureau of the MAB International Co-ordinating Council at its meeting on 6–8 November at UNESCO Headquarters.

The new biosphere reserves differ in size, population density, ecological features, land use and challenges. They are Chrea (Algeria), Las Yungas (Argentina), Mornington Peninsula and Western Port (Australia), Thousand Islands – Frontenac Arch (Canada), Dalai Lake (China), Jaragua-Bahoruco-Enriquillo (Dominican Republic), Badiar and Haut Niger (Guinea), Valle del Ticino (Italy), Hustai Nuruu (Mongolia), Jeju Island (Republic of Korea), Commander Islands, Darvinsky, Nijegorodskoe Zavoljye, Smolensk Lakeland and Ugra (Russian Federation), Las Dehesas de Sierra Morena and Terras do Miño (Spain).

The Biosphere concept



The concept of 'zoning' helps to accommodate different forms of land use. Strictly protected core areas are surrounded by buffer zones where conservation is emphasized but where people also live and work; the whole is encircled by a transition area promoting sustainable development.

© Photo: Eloy Lopez.

Las Yungas Biosphere Reserve in Argentina

All the new sites and extensions were proposed by the countries concerned. Membership in the World Network of Biosphere Reserves entails official United Nations recognition of local and national efforts to meet global concerns for environmental sustainability. It also represents a 'label of excellence' which helps secure funding and promote both tourism and other local economic activities.

For details of all the Biosphere Reserves, go to:
www.unesco.org/mab/wnbr.htm

The International Year of **Freshwater** gets under way

On 12 December, the International Year of Freshwater was launched at the United Nations in New York and at UNESCO Headquarters where the Director-General, Koïchiro Matsuura, held a special briefing.

UNESCO and the United Nations Department of Economic and Social Affairs are the lead agencies for the Year on behalf of the United Nations system.

The Year will foster awareness of the importance of sustainable freshwater use. Important events include World Water Day on 22 March, the eight-day 3rd World Water Forum in Kyoto (Japan) where the *World Water Development Report* will be released on 22 March and the Pan-African Conference on Water Resources Management in the autumn in Addis Ababa (Ethiopia).

The Year's website is managed by UNESCO-IHP and the World Water Assessment Programme. Open to everyone, it focuses on education and activities at the local and national levels. Countries, schools, educators, United Nations agencies and individuals of all ages will find resource

material there for planning their own activities, including the Year's logo and ideas on how to participate, contests, tips, fact sheets, stories and pictures.

The next issue of *A World of Science* will include a dossier on the Year.

For further information, contact: wateryear2003@unesco.org, *or go to:* www.wateryear2003.org

UNESCO and SUEZ join forces to improve access to water

A cooperation agreement to improve access to water for all was signed on 14 October at UNESCO Headquarters by Koïchiro Matsuura, Director-General of UNESCO, and Gérard Mestrallet, Chairman of the SUEZ group.

The agreement outlines several areas of action for which SUEZ will provide about 300,000 € for the first three years. The first concerns a new UNESCO interdisciplinary initiative to rehabilitate the Volga–Caspian basin. Home to more than 60 million people, the basin's environment is suffering from decades of massive industrialization and urbanization. Forty-two million tons of toxic waste accumulate in the basin every year, out of which only about 13% are neutralized and re-used.

The initiative will involve all five of UNESCO's international science programmes, which cover geology, hydrology, oceanography, ecology and social sciences. People have been placed at the very centre of the project, which was designed by both scientists and all other stakeholders in the region. One of the project's main targets will be to define 'sustainability indicators' in the areas of health and nutrition, human and environmental security, habitat and quality of life. A timeline of 30 years has been fixed for reaching the target. SUEZ will contribute to this initiative both financially and by offering expert advice in improving drinking water quality.

The new partnership will also benefit the UNESCO Chair for 'Integrated Water Resource Management', based in Casablanca, Morocco[7]. This Chair has been extremely active throughout North Africa, working closely with NGOs, university students and journalists to raise public awareness about water governance. The company has also agreed to set up several bursaries in water-related fields for researchers from developing countries.

7. rabat@unesco.org

SUEZ is a global leader providing water services in both industrialized nations (87% of its turnover) and developing countries.

For further information, contact: j.bogardi@unesco.org *or* gdellicour@suez.com, *or go to:* www.unesco.org/water

UNITWIN blows out ten candles

To celebrate UNITWIN's 10th anniversary and achievements so far, UNESCO invited all its Chairholders to a World Forum from 13 to 15 November at its Paris Headquarters.

The UNITWIN/UNESCO Chairs programme works by encouraging universities, higher education and research institutions, both private and public, to twin with each other and sign scientific cooperation agreements. The universities are then asked to extend these agreements to other universities in order to set up networks. This helps some institutions, especially in developing countries, to break out of their isolation and improve their access to, and use of, the most up-to-date information and communication technologies. It also helps forge academic partnerships that direct students towards subjects relevant to their countries' needs.

Ten years down the track, the number of Chairs has mushroomed to some 500 in 113 countries. All were established with formal agreements linking each institution to UNESCO.

Thousands of teachers and students all over the world are involved, but also major partners, such as NGOs and private firms, which provide substantial funding. UNITWIN projects have received some US$30 million in support over the past five years.

Of the 17 UNESCO Chairs singled out for awards during the Forum, nearly half concern science: UNESCO–Cousteau Ecotechnie Chair, South Valley University, Aswan (Egypt); UNESCO Chair in Water Resources, Omdurman Islamic University, Khartoum (Sudan); NKK/UNESCO Chair in Metallurgical Engineering, Chulalongkorn University (Thailand); UNESCO Chair on Sustainable Development, Universidad Federal do Rio de Janeiro (Brazil); UNITWIN Network on Mediterranean Water Management, Université de Nice-Sofia Antipolis (France); UNESCO–Cousteau Ecotechnie Chair, University of Bucharest (Romania); UNESCO Chair in Energy Conservation and Renewable Energies, National Technical University (Belarus).

For further information, go to:
www.unesco.org/education/index.shtml

Space allows us to dream

'When Mark Shuttleworth became the first African in space', writes Carike Bosman in her award-winning essay, 'something else was achieved: people across Africa were reminded again that they are allowed to dream, to work towards their dreams and that their dreams can come true.'

Carike Bosman with Umberto Guidoni, the first astronaut from the European Space Agency to visit the International Space Station, in April 2001

Seventeen-year old Carike Bosman of South Africa has been awarded first prize in the international space essay contest organized for teenagers by UNESCO and the European Space Agency (ESA) on the theme of 'space and my daily life'. Carike took home US$1,000 dollars in prize money from the award ceremony organized on 7 October in the ESA's European Space Research and Technology Centre (Noordwijk, Netherlands) as part of World Space Week.

Second Prize went to another seventeen-year old, (Ms) Divya Vaze from China. Third prize was shared between Jennifer Przybylo (17 years, USA), Phleappe Vwyioslf De Vera (17 years, Philippines) and (Ms) Kim Derose (15 years, USA). The Special ESA prize went to 16-year old Alastair Evans from the United Kingdom and the Special UNESCO Prize for Developing Countries to 15-year old (Ms) Lesieli Matonga Ahomana from Tonga.

The contest was organized as part of UNESCO's new Space Education Project (SEP)[8] inspired by the 1999 World Conference on Science (Budapest) and 1999 UNISPACE III Conference (Vienna). SEP strives to improve science education by developing new curricula and teaching methods adapted to today's educational needs. It targets secondary level students and teachers, university and post-graduate students, young professionals and the general public. Activities in the pipeline include the creation of a Space Volunteer Programme, the sponsorship of teacher training workshops and multimedia educational materials.

8. http://www.unesco.org/science/earthsciences/sep.htm

From 13 to 15 March, UNESCO is organizing an expert workshop on Bridging Space and Education, together with the International Space University, International Astronautical Federation and International Academy of Astronautics. The workshop will prepare an advocacy plan for gradually introducing space studies into school curricula, with emphasis on higher secondary education.

For further information, contact: y.berenguer@unesco.org
or go to: www.isunet.edu

Young researchers win MAB grants

'We would like to be able to offer three times as many awards', exclaimed Peter Bridgewater, Director of the Division of Ecological Sciences, as the names of the winners of a Man and the Biosphere (MAB) Young Scientists Research grant were read out in Paris on 8 November.

Four women and six men were each awarded close to US$5,000 to pursue research in one of UNESCO's Biosphere Reserves around the world.

The awardees are Mr Lahcen Kabiri (Morocco), Ms Daorung Jajing (Thailand), Ms Nguyen Thi Kim Cuc (Vietnam), Ms Etotépé Sogbohossou (Benin), Mr Daouda Cisse (Guinea), Mr Youssoufa Issiaka (Niger), Ms Luz Margarita Figueredo Cardona (Cuba), Mr Mounir Abi-Said (Lebanon), Mr Alaa El Sadek (Egypt) and Mr Demetrius Kweka (Tanzania).

Each grant was awarded by the MAB Bureau on the basis of a specific research project, such as Mr Kabiri's study of the impact of climate and human change on water resources in the Ferkla Oasis or Ms Jajing's comparative studies on activating participation in managing sustainable mangrove forest in the Andaman coastal zone.

After reading out the winners, the Chairman of the MAB Bureau meeting, Mr Driss Fassi, commented solemnly, 'We know the suffering of young researchers in the developing world. More than providing financial support, these grants shine the spotlight on deserving young researchers who come to the aid of these biosphere reserves whose own needs are so great.' Fassi regretted that 'everywhere, the money trail is turning countries away from academic pursuits.' He stressed that, although priority was given to candidates from the South, the grants were open to researchers in developing and developed countries alike 'because research is underprivileged everywhere and necessary everywhere'.

For further information, go to:
www.unesco.org/mab/index.htm

Patricio Bernal

Why the IOC is 'watching' research on ocean storage of carbon

New technologies are making it possible to 'capture' excess carbon from the atmosphere and store it in the sea. Could this buy us precious time in which to adopt cleaner energy fuels or would we simply be leaving a time-bomb for future generations? Scientists are not yet able to say what environmental impact carbon sequestration would have. In the meantime, the political and economic stakes are high and the debate has become a passionate one.

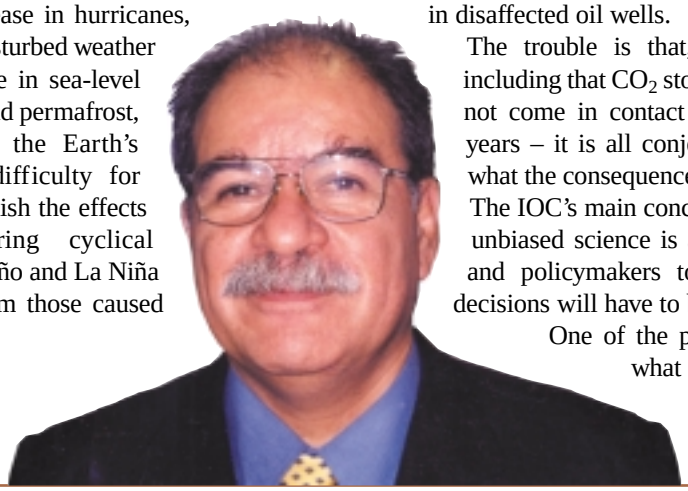
Patricio Bernal, Executive Secretary of the Intergovernmental Oceanographic Commission of UNESCO (IOC), explains why UNESCO has set up a an Advisory Panel on Ocean Carbon Dioxide with the Scientific Committee on Oceanic Research (SCOR), in order to ensure that decision-makers and the general public have access to an unbiased picture of worldwide research on ocean carbon sequestration.

Is there a proven link between climate and carbon?

We know from glacier records that there is a correlation between carbon levels in the atmosphere and climate. At the start of the last Ice Age some 50,000 years ago for example, atmospheric CO_2 levels were low. Today, the climate is going through a naturally warm period; this, combined with the burning of fossil fuels and biomass, as well as land-use changes, over the past two centuries, has sent atmospheric CO_2 concentration in the atmosphere to levels never seen before. Present carbon levels are now higher than this planet has experienced for at least the last 20 million years. Human activity is releasing something like 7 Gigatons of carbon per year into the atmosphere. And the excess carbon is not going to disappear. Even if all the countries around the world were to implement the 1997 Kyoto Protocol, which calls for them to bring CO_2 emissions down to below 1990 levels by 2012, it would not solve the problem of the existing excess, although it would limit the future accumulation of CO_2 which in itself would be a major achievement.

What does this mean?

We are heading for an increase in hurricanes, floods, droughts and other disturbed weather patterns, together with a rise in sea-level and the melting of glaciers and permafrost, which store two-thirds of the Earth's freshwater reserves. The difficulty for scientists today is to distinguish the effects of the naturally occurring cyclical disturbances caused by El Niño and La Niña oscillation, for example, from those caused by global warming.



Patricio Bernal

But why store carbon in the oceans?

Faced with the stark reality, even the International Panel on Climate Change has admitted that we may have to consider what it calls 'carbon management strategies' to complement reductions in greenhouse gas emissions. One option is to store the excess carbon on land; this is already being done in deep geological formations, abandoned mines and the like.

But it is the oceans which have the greatest natural capacity to absorb and store carbon. As much as 85% of carbon in the atmosphere is already absorbed by the surface ocean naturally. The ocean contains an estimated 40,000 billion tons of carbon, as compared to 750 billion tons in the atmosphere and about 2200 billion tons on land. This means that, were we to take all the atmospheric CO_2 and put it in the deep ocean, the concentration of CO_2 in the ocean would change by less than 2%.

Experiments have shown that, up to a depth of 3000 m, liquid CO_2 tends to rise to the surface because it is less dense than the surrounding seawater. At 3000 m, on the other hand, it turns into a solid, ice-like substance that is denser than the surrounding water. One method being considered is that of injecting liquid CO_2 into the sea floor. Another is to store it in disaffected oil wells.

The trouble is that, even if theories abound – including that CO_2 stored at a depth of 3000 m would not come in contact with the atmosphere for 200 years – it is all conjecture. We simply don't know what the consequences would be over the long term. The IOC's main concern is to make sure that sound, unbiased science is available to the general public and policymakers to address these issues when decisions will have to be made.

One of the principal scientific concerns is what will happen naturally if we do nothing to reduce atmospheric CO_2 levels: the pH of the

*A large Pacific Grenadier fish (*Coryphaenoides acrolepsis*) feeding close to CO_2 being released into a 44 cm-diameter corral on the sea floor at 3600 m depth (captured frame from video)*

surface ocean will decrease, causing the water to become more acidic. This will affect the chemistry of the surface ocean where most marine organisms live. We don't yet understand how the ecosystem will respond to this slow, natural invasion of CO_2. This concern has led some scientists to suggest that it may be less damaging to take CO_2 out of the atmosphere and inject it directly into the deep ocean where only a small fraction of marine organisms live. The problem is that these organisms living in the deep ocean would be particularly affected because of the rapid change in their environment and the fact that their slow metabolisms make it very difficult for them to adjust to changes.

And what would be the effect on the atmosphere if, some 100 or 200 years from now, an enormous quantity of accumulated CO_2 buried in the deep ocean began to slowly leak back into the surface ocean and into the atmosphere?

What else are you 'watching'?

Iron fertilization research, for example. In many parts of the ocean, phytoplankton growth is limited by the lack of an essential micro-nutrient, iron. A number of private companies are trying to stimulate phytoplankton growth to up to 30 times the natural rate so as to create what might be termed ocean carbon sinks, much along the same principle as the forests being promoted as carbon sinks on land. The concept is not a new one. Oceanographer John Martin became famous in the 1970s by declaring 'Give me a ton of iron and I'll produce the next Ice Age'.

Iron is found in dust which is best carried into the atmosphere in dry, arid conditions. Not surprisingly, it is the Sahara and Sahel deserts that contain most of this dust, which prevailing winds blow over the Atlantic to the Caribbean and north-eastern Latin America.

Scientists estimate that fertilizing the entire Southern Ocean with iron would only reduce atmospheric CO_2 levels by about 20–30% over a century. More seriously, it would lead to significant ecological perturbations. When organisms die, their decomposition consumes oxygen. Creating an unnatural abundance of decomposing organisms would lead to low oxygen levels that could be devastating to marine life.

Is it ethical to pursue research in such a controversial area?

The best argument against ocean carbon storage would be to prove that it is environmentally unsound. However, we mustn't be naïve. Carbon trading is a profitable business. The only thing holding back many potential traders from storing carbon in the ocean tomorrow is the cost of the technology.

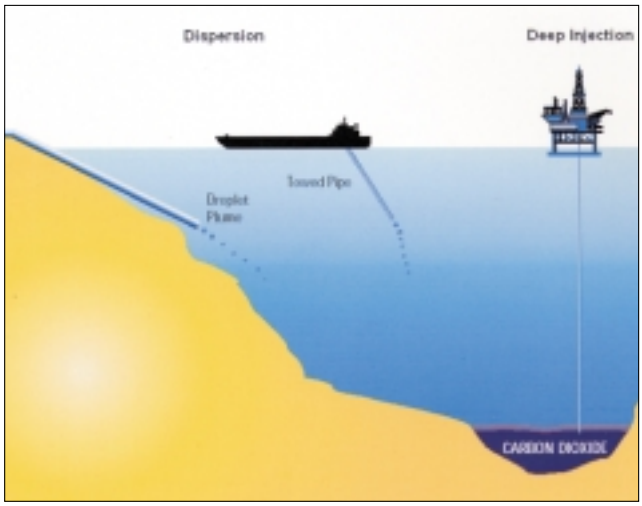
What do you think of Greenpeace's role in putting a stop to an environmental impact assessment in Norwegian waters last August?

It was misguided in my view. I share Greenpeace's concern that high concentrations of CO_2 may harm deep marine organisms. We don't know today what ultimate effects a slow invasion of CO_2 would have on the ecosystem composition and food-chain.

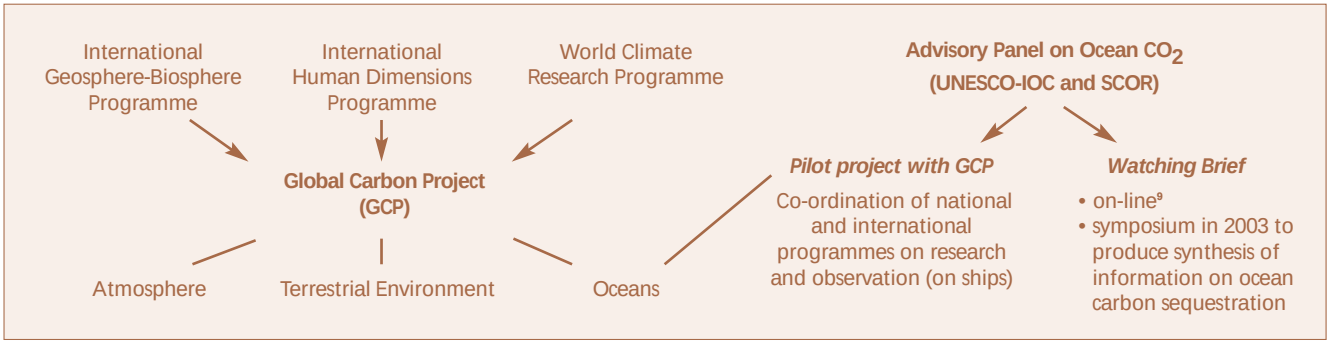
But in preventing a consortium of research institutions from Norway, the USA, Canada, Australia and Japan from carrying out an assessment that might have substantiated Greenpeace's claims, the environmentalist was shooting itself in the foot.

We need to get the debate out into the open. After all, in the final analysis, whether or not the world resorts to ocean carbon storage will be a societal decision.

The Norwegian government has called for more international debate on ocean carbon storage. This is what the member states of the IOC are trying to promote within the Watching Brief. We have set up the Brief to provide governments, industry and the general public with access to the results of unbiased research. Via the Watching Brief on the web[9] and as an active observer and participant in research, the IOC is fulfilling an advisory and advocacy role.



Ocean storage: methods of dispersing CO_2 and injecting liquid at depth



UNESCO's role in the Global Carbon Project

The Norwegian government bowed to pressure from the environmentalists out of concern that it might be trespassing international marine law. Does this mean that CO_2 is considered a pollutant?

According to the Office for the London Convention[10], there is no unanimity on the issue of whether fossil fuel-derived CO_2 should be regarded as industrial waste. This causes a legal void, since the various treaties and conventions governing dumping in the oceans only refer to 'industrial wastes'. The London Dumping Convention bodies should look into the matter.

IOC's Watching Brief also documents the legal aspects of ocean carbon storage. There is a plethora of legal instruments – the United Nations Framework Convention on Climate Change, the United Nations Law of the Sea, Kyoto, etc. – but these government treaties have no power of enforcement; that poses a real problem. The Scientific Group of the London Convention recently developed a Waste Assessment Framework which would require a full environmental impact assessment before a permit could be delivered for CO_2 dumping. This is a step in the right direction but it is insufficient.

In the absence of a coercive legal instrument, isn't there a danger that ocean carbon storage will be seen as a permit to pollute?

Yes, there is a very real danger that it will make us more irresponsible rather than less so. We should be moving towards cleaner fuels at a much faster rate. Everyone knows that, within the next few decades, fossil fuels will begin to run out and we shall be forced to adopt alternative sources of energy. The USA for example depends on fossil fuels for approximately 85% of its energy needs and these are growing every year. Despite the urgency, the proposed target of attributing a 10% market share to renewable energies was still rejected by governments at the World Summit on Sustainable Development in Johannesburg last September.

Industry has invested considerably in research on alternative energy sources. At the Johannesburg Summit, everybody could see a number of BMW hydrogen-powered cars on display. The problem is that industry receives little government support to invest in renewable energies and conversion from petrol-driven to 'clean' cars has a huge cost. Governments should be providing incentives, such as tax rebates, and investing in the necessary infrastructure. It's not a technological problem but a political one. Prototype cars driven by liquid petroleum gas, compressed natural gas, hydrogen (i.e. water vapour) and the like have been around for decades.

Are there grounds for optimism?

Over the centuries, we have engineered an artificial world for ourselves, to the point where more than 60% of the natural landscape is of our own making. The temptation has always been to engineer a new world rather than to respect the boundaries of the existing one.

With ocean carbon storage, we must beware of the same compartmentalized reflexes which have been our undoing in the past. Take the example of DDT. Paul Muller was awarded the Nobel Prize in medicine and physiology in 1948 for discovering the effectiveness of DDT as an insecticide, notably against malaria-bearing mosquitoes. Only after DDT had been put to extensive use was it realized that many species of insects had developed resistance to it and that it had a high toxicity towards fish and animals – upon which DDT was banned in many countries.

Instead of considering our planet as a whole made up of interdependent systems, we are always tempted to look for simple solutions to complex problems. We forget that the atmosphere, land and oceans are three sides of the same triangle, that what we do to one will affect the other two. I do believe we are making progress – physics, chemistry and biology are beginning to be integrated into a single conceptual model to deal with planetary processes – but there is a long way to go.

We must tread carefully with ocean carbon sequestration, take the time we need to get our science right. As technology progresses, the consequences of our acts are becoming harder to correct – or even to anticipate.

Interview by Maria Hood and Susan Schneegans

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9. http://ioc.unesco.org/iocweb/co2panel/sequenstration.htm
10. Convention for the Prevention of Marine Pollution by Dumping Wastes and Other Matters, 1972 and 1996 Protocol

Practical laboratory work

To be or not to be?

'For the teachers manipulating the miniature science kits they will soon be wielding in front of pupils, it is a stressful experience. On top of being unfamiliar with the kits themselves, many of the teachers attending the course have hardly ever come in contact with laboratory material, even at university.' This observation by Jean-Bosco Talla, one of the 20 teachers of life and earth sciences from Yaoundé attending the training course at the Centre of Excellence in Microscience Experiments on 23 October 2002, sums up the situation in much of Central Africa today.

For years, the exorbitant cost of equipping schools and universities with laboratories has posed a headache to governments everywhere but especially in developing countries. In much of Central Africa, it prompted primary and secondary schools to adopt a purely theoretical approach to science teaching for many years.

That model has proved its limitations. As Alexis Pokrovsky of UNESCO puts it, 'How can any country train scientists, let alone promote the national research which is indispensable to development, without experimentation? Even the most practical notions appear abstract to a student who can't put theory into practice. And nothing compensates for the solid grounding in physics, chemistry and biology which experimentation provides.

In our primary and secondary schools, we tend to favour theory over practice in teaching. As a result, our children fail to come to grips with science.

Mr Nébén Alndingaluouel, representative of Chadian Minister of Education

Yet the reality of science teaching is still far from satisfactory', Pokrovsky notes. 'Little or no practical activity is available in many school classrooms and university laboratories. This is particularly so in the developing countries but even in wealthy countries you find virtual substitutes for laboratory experiments, such as computer-based simulations and video sequences. In poor countries, science teachers often have no more than a blackboard to work with.'

UNESCO and its partner, the International Union for Pure and Applied Chemistry (IUPAC), were faced with a dilemma. In order to promote quality science education worldwide, they needed to be able to propose low-cost experimental equipment that any country could afford.

They found the answer in South Africa. The Global Project on Microscience Experiments launched by UNESCO and IUPAC in 1996 is inspired by an innovative methodology for practical work in science teaching which originated to a great extent from the RADMASTE Centre at the University of the Witwatersrand in Johannesburg, South Africa.

As the name suggests, the RADMASTE Microchemistry System focused initially on chemistry experiments. But the basic concept can be adapted to experimentation in many other areas of science, including physics, material sciences, geology, hydrology, biochemistry, biotechnology and agriculture. Other kits have been added to the original RADMASTE Microchemistry System, including the Basic and Advanced Microchem Kits, the Microburette Kit, the Bar LED Microconductivity Kit, Microbiology Kit and Microelectricity Kit.

The universal set of equipment designed by RADMASTE replaces the traditional glass test-tubes, beakers, flasks and measuring cylinders.

With microscience, you can prolong teaching beyond the school gates.

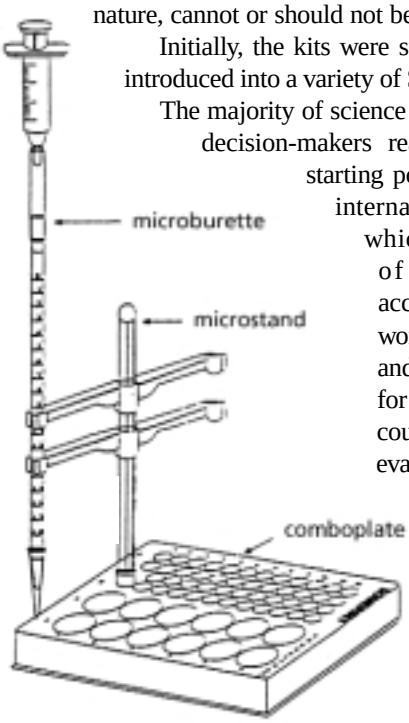
Mr Juma Edouard, representative of the Burundi Minister of Education

The idea was inspired by cost and health considerations in chemistry and biochemistry that have led laboratory practice to move steadily from the traditional large scale (10–1000 ml) to the smaller scale (0.1 ml–10 ml). The microscience kits are affordable, at US$5–10 each, and innocuous. Unlike conventional laboratories, they pose no safety risk to either the user or the environment. The small quantity of chemicals used means little wastage and no danger of contamination or accident. The kits have potentially worldwide appeal and are beginning to catch on in Europe and North America.

The kits also have their limitations. Besides demanding a lot of concentration due to their small size, they are inappropriate for certain experiments in biology and physics or other areas of science which, by their very nature, cannot or should not be microscaled.

Initially, the kits were successfully tested and introduced into a variety of South African schools. The majority of science teachers, students and decision-makers reacted positively. The starting point each time was an international workshop at which the presentation of the concept was accompanied by practical work for all participants and the provision of kits for further testing in the country, coupled with an evaluation of the system.

The Cameroon government immediately



Microscale titration (material manufactured by the South African firm Somerset International)

recognized the kits' potential for strengthening science and technical education. By December 2000, more than 7000 kits were being used in secondary schools across the country.

As the pilot project developed, it became urgent to provide a structure for the introduction and monitoring of microscience in primary and secondary schools. UNESCO suggested setting up a Centre of Excellence in Microscience Experiments.

The Général Leclerc High School in Yaoundé, one of the largest secondary schools in the world with a roll of almost 5000, was chosen to host the Centre.

At the Centre's inauguration on 21 January 2001, Professor Joseph Owona, Cameroon Minister of Education, declared, 'This Centre is the culmination of discussions held jointly by UNESCO and Cameroon to give science education the defining characteristic it deserves, namely that it must first and foremost be experimental to be attractive'.

The first sub-regional seminar was organized at the Centre in December 2000 by IUPAC, UNESCO and the five governments of the Economic community of Central Africa (CEMAC): Cameroon, Central African Republic, Chad, Congo Brazzaville and Gabon. Entitled 'For or against practical laboratory work in CEMAC countries', the seminar was attended by the Ministers of Education of the five CEMAC countries and their experts. By the seminar's end, the five countries had resolved to turn the Centre of Excellence in Microscience Experiments into a sub-regional centre.

Microscience is a way of demystifying science for our children.

Mr Mbouna Sidoine, Secretary-General of Gabonese Ministry of Education

Within the Centre's broad mandate, training courses are run in all five CEMAC countries for primary and secondary teachers, provincial inspectors and national education officers. Other activities include needs assessment and the preparation of methodologies and training modules to accompany the introduction of new kits into schools, such as that for electricity in 2002. The Centre also plays an advocacy role; it encourages schools to adopt the kits and is planning 'olympics' in chemistry, mathematics and other disciplines to stimulate a vocation for science among pupils.

The Centre comprises six sections: chemistry, mathematics, life and earth sciences, technology, physics and basic education. Two education inspectors head each division, one English-speaking and the other French-speaking.

There is a conference room, documentation room, laboratories and a workshop for the manufacture of experimental materials. Courses organized since the Centre was inaugurated have included such varied fields as mechanics, optics, electricity and acoustics.

Today, nearly 40 countries from Africa, the Arab region, Central Asia, Central and Eastern Europe, Latin America and the Caribbean, are participating in the Global Project for Microscience Experiments. Close to half of these are currently implementing pilot projects to adapt the kits to their own national needs. In addition to Cameroon, some of the most extensive pilot projects are being conducted in Kenya and South Africa.

UNESCO and IUPAC support the basic student kit with

© CEEM

Science teachers at a training course organized by the Centre of Excellence in Microscience in Yaoundé, Cameroon

packs of pre-prepared chemicals and other materials, as well as sets of teacher–pupil manuals which governments are encouraged to adapt to national curricula and methodologies. UNESCO recently translated these manuals into Portuguese specifically for Angola and Mozambique.

The number of partners is growing. Together with the Kaddafi International Foundation for Charitable Associations, an NGO, UNESCO is helping to develop centres for microscience experiments in 22 countries of North and Sub-Saharan Africa.

Through the Islamic Call Society, another NGO, a total of 120 pilot secondary schools have been established since 1999 in Mali, Niger, Chad and Burkina Faso. Guinea-Bissau, Gambia and Cap Verde are currently requesting Participation Programme funding from UNESCO for pilot schools in their own countries. Gabon intends to create a satellite centre of the Yaoundé Centre of Excellence in Microscience Experiments using Participation Programme funding.

Even with the best will in the world, our governments don't have the means to install a laboratory in every secondary school. The less costly microscience experiment is a very interesting prospect.

Mr Mahoukou Prosper, representative of Congolese Minister of Education

The Global Project on Microscience Experiments includes teacher training courses organized under a co-operation agreement between UNESCO and the Islamic Educational, Scientific and Cultural Organization (ISESCO). Ten such courses were organized in Sub-Saharan and North Africa in 2001. This year, the geographical scope of the project has been enlarged to include not only countries in Africa but also Muslim countries in Europe and Asia, such as Bosnia Herzgovina and Azerbaïjan; in 2002–2003, some 17 countries will benefit from training courses.

'Worldwide', concludes Pokrovsky, 'there is an urgent need to renew, expand and diversify basic science education for all to make sure that tomorrow's citizens are equipped with the scientific and technical skills they will need to participate in the society of the future. It is an enormous challenge – one we cannot afford to ignore.'

Susan Schneegans

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Diary

28 December–7 January
UNESCO water exhibit at 20th World Scout Jamboree, Hadyao Chonburi (Thailand): g.weybrecht@unesco.org; www.worldscoutjamboree20.org/

6 January
Ground-breaking ceremony for International Centre for Synchrotron Light for Experimental Science and Applications in the Middle East (SESAME), Allan, Jordan: c.formosa-gauci@unesco.org

7–10 January
Ocean Science Conference, hosted by UNESCO-IOC for new SCOR-IGBP programme OCEANS (new 10-year international research programme on links between biogeochemistry and ecosystems): www.igbp.kva.se/obe

13–14 January
Science, Technology and Innovation: a Parliamentary Perspective, roundtable co-organized by UNESCO and Parliament of Finland, sponsored by ISESCO, regroups presidents of 50 Parliamentary Science Committees, scientists, ministers, industry, science media: m.el-tayeb@unesco.org

13–15 January
Ocean Carbon Coordination project, first meeting to launch observation database after 10 years of ocean observation on volunteer commercial vessels (see p. 11): m.hood@unesco.org

15–18 January
1st meeting, international organizing committee for **World Climate Change Conference** end 2003: Moscow@unesco.org; or IOC: m.hood@unesco.org

2–6 February
Training-through-Research programme ('Floating University'), International Conference on Geological Processes at Deep Sea European Margins and Oceanic Basins, Bologna (Italy): marani@igm.bo.cnr.it, www.ioc.unesco.org/ttr

3–7 February
International Geological Correlation Programme (IGCP), 31st Board Session, room XIII, UNESCO Paris: m.patzak@unesco.org

17–18 February
1st international organizing committee meeting for 2003 symposium on **ocean carbon sequestration**, National Academy of Sciences, Beckman Center, Irvine, California (USA), (see pp. 11–13) IOC: m.hood@unesco.org

17–23 February
Workshop to prepare sacred sites study, Kunming (China) (see p. 3)

27 February
L'OREAL/UNESCO Ceremony for Women in Science Awards, UNESCO Paris Headquarters: r.clair@unesco.org, www.loreal.com/loreal-women-in-science

10–15 March
Ecotone/SeaBRnet joint workshop, (SeaBRnet is 1st Southeast Asian Biosphere Reserve Network) on conservation and management of freshwater ecotone ecosystems; in Jakarta: q.han@unesco.org or k.nitta@unesco.org

13–15 March
Bridging Space and Education, ISU/IAF/IAA/UNESCO expert workshop, UNESCO Paris (see p. 10)

16–23 March
3rd World Water Forum, Kyoto (Japan) www.worldwaterforum.org/eng/index.html (see p. 8)

22 March
World Water Day. Launch of *World Water Development Report* at World Water Forum (above), *Water for People, Water for Life* (see p. 8)

New Releases

Status of Coral Reefs of the World 2002
Joint UNESCO-IOC, UNEP, IUCN, World Bank biennial report, 378 pp., English only. Case studies; dispels doubts as to the value of establishing no-take areas to protect fish stocks and encourage better coral growth; notes that, four years after 16% of the world's coral reefs were destroyed by massive global coral bleaching during the big El Niño year, half are showing signs of recovery; predicts that many of the world's coral reefs will continue to decline, owing to increasing levels of sediment and nutrient pollution from sewage, agricultural runoff and massive over-fishing. Request a free copy, while stocks last, from: ioc@unesco.org; or go to: http://ioc.unesco.org

Harnessing science to society
UNESCO/ICSU progress report on first two years of follow-up to World Conference on Science (Budapest, 1999). English only, 41 pp. Available on-line at www.unesco.org/science/wcs

Coastal environment and fishing law in Haiti
CSI Info 13. Bilingual French and Creole, 45 pp. Request a free copy from: unescohaiti@hainet.net; or the Fondation pour la protection de la biodiversité marine: foprobim@aol.com

Space activities in UNESCO
12-page brochure produced by UNESCO's Division of Earth Sciences, exists in French and English. Describes role of space activities in the programmes of UNESCO, member of IGOS (www.igospartners.org). Project co-ordinator: Robert Missotten. Request a free copy: g.khavarani@unesco.org

For sales publications: www.upo.unesco.org

Governing Bodies

UNESCO moves forward on international basic sciences programme

At the last session of UNESCO's biannual Executive Board, which ended on 17 October, UNESCO's Programme and External Relations (PX) Commission invited the Director-General to convene an ad hoc expert meeting representative of the various geographical regions to prepare a draft preliminary International Basic Sciences Programme.

The Commission had before it the Report by the Director-General on the results of the feasibility study on the creation of an international basic sciences programme (165 EX/9). The great majority of speakers favoured the option of a worldwide network of centres of excellence in basic research and science education for development, believing it would provide the most appropriate platform for capacity-building in science.

Despite the fact that UNESCO is currently giving priority to water-related issues and the follow-up to the World Summit on Sustainable Development, several Members of the Commission felt the initiative to create an international basic sciences programme was a timely one and called for prompt action. Others offered the services and assistance of their science institutions and leading specialists in the development of any new programme.

The Commission invited Member States to promote the cause of the basic sciences in general and invited the Director-General to report on the outcome of the expert meeting to the next session of the Executive Board, which begins on 31 March 2003.

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