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Science Committee
Committee on the Challenges of Modern Society

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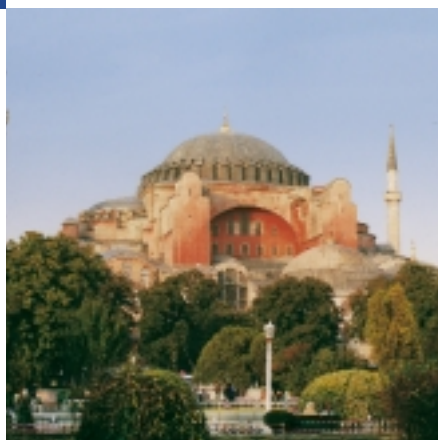
NATO Summit, Istanbul, June 2004
Spotlight on Turkey



The NATO Heads of State and Government will hold their next meeting in Istanbul, in June. NATO summit meetings are not frequent events. The Istanbul summit will be only the 17th such meeting in NATO's 55-year history.

To mark the occasion of the visit of NATO's leaders to Turkey, this edition of the Science, Society, Security News is a special issue featuring Turkey's participation in NATO's cooperative science and environment activities.

One of the events surrounding the summit will be an exhibition illustrating NATO's response to disasters and civil emergencies, which features not only science and environment activities, but also NATO's civil emergency planning activities. The role NATO has played in Turkey's efforts to mitigate the effects of the devastating earthquakes to which the region is prone, will be a major element of the exhibition.

Another event will be the presentation of a special NATO Summit Science Prize to Turkish scientists and institutions, for their achievements in research on alleviating the consequences of earthquakes and fostering cooperation between NATO and Partner countries.

Turkey's neighbours in the Caucasus and Central Asia are also actively engaged in NATO's science and environment activities, and they too are featured here, and especially in their regional partnerships.

Turkish participation in the Science Programme and CCMS is of long date. The comments of the Turkish representatives on the Science Committee and the CCMS, to be found on page 8, indicate that the possibilities for collaboration under the NATO programmes continue to be a valuable resource for the Turkish research community.

An overview of Turkish participation

Scientists forging partnerships

- Since 1999 over 70 Turkish scientists or research teams have received NATO collaborative grants, and a further 1000 have received NATO Science Fellowships. About 900 Turkish scientists have participated in NATO Advanced Study Institutes or Advanced Research Workshops in the same period. Eight Science for Peace projects are underway involving Turkish research institutions.
- The Collaborative Linkage Grants (CLGs), which are the majority of the collaborative grants, have ranged over all subjects, although earthquake studies account for 15 per cent of the CLGs and Black Sea studies account for a further 15 per cent.
- Turkey has also been active in regional cooperation with her Caucasus neighbours, reflecting their geographic proximity and close historical links; 75 per cent of NATO Science Fellowships awarded to Azerbaijan scientists since 1999 have been given by Turkey; 32 per cent of Collaborative Linkage Grants awarded to Turkey since 1999 have been for collaboration with her neighbours in the Caucasus.
- NATO funding for Turkish scientists is all the more significant because Turkey is not a member of the European Union, and her scientists do not therefore have access to that source of support. Turkey was a participant in the former Science for Stability Programme, a forerunner of the current Science for Peace support mechanism, which offered support for innovative R&D investment in Turkey, Portugal and Greece, and 27 Turkish projects were successfully completed.

- Disaster Forecast and Prevention
- Water Resources Management

These are just two of the Priority Research Topics included in the current Security Through Science Programme. The full list of topics in security-related science supported under the new programme may be found at www.nato.int/science.

Strengthening Turkey's industrial R&D capabilities

The success of NATO project support may be illustrated by the achievements of the ceramic coating and characterization laboratories of the Istanbul Technical University, which were established by Professor Ali Fuat Çakir and Professor Mustafa Ürgen, as a result of NATO funding. Students educated at the laboratories now work in almost all of the hard ceramic coating companies in Turkey. The laboratories support scientific and applied projects of Turkish companies through university-industry cooperation projects.

One of the ceramic coatings developed is up to five times harder than the hardest steel. It is as thin as 1/30th the width of a human hair, and incorporates nano structures one millionth of a centimetre in size. The NATO-funded project was carried out in collaboration with the Catholic University of Leuven, Belgium, and the Moscow State University of Technology, Russia.

CCMS reports available free-of-charge from ccms@hq.nato.int

- Black Sea Integrated Coastal and Shelf Zone Monitoring and Modeling (INCOM) Program Science Plan - Report N°. 248, published December 2000
- Review of Environmental Projects of the Caspian Sea for the Planning of Future Activities - Report No. 239, published November 1999
- Black Sea Observation And Forecasting System (BSOFS) Science Plan - Report N°. 221, published September 1997

Turkey and the CCMS

Turkey has been an active participant in the studies of the Committee on the Challenges of Modern Society (CCMS) since it began, and her participation shows no signs of abating. Turkey is at present participating in ten pilot studies and short term projects and is leading four CCMS studies.

A number of the studies Turkey has led in recent years have addressed regional security issues involving the Black Sea and the Caspian Sea. One study, for example, undertaken with the participation of all the surrounding countries, resulted in development of an integrated coastal zone management programme for the Black Sea. Another study addressed the environmental security of transporting oil and gas through the Black Sea and the Caspian Sea, with Turkey working in collaboration with Georgia. Still another dealt with planning for the future environmental health of the Caspian Sea, with Russia as collaborating country. A current study of the Caspian Sea basin is highlighted on page 6, together with a study of sustainable management of coastal lagoons.

Non-traditional threats to security

The aim of the CCMS key objective "Non-traditional threats to security" is long term thinking on security issues with a view to assessment, prevention or remediation on a collective basis.

Issue 65 of the newsletter (December 2003), reported on the CCMS study led by Turkey on Food Chain Security, which is being undertaken in the light of this key objective. Another Turkish-led study, outlined below, addresses the safety and security of vulnerable waterways.

The security of narrow waterways

The safety and security of specific maritime assets that may face terrorist attacks is the focus of this study, led by Turkey and with the participation of Bulgaria, France, Georgia, Germany, Greece, Romania, Turkey and the USA. World trade depends heavily on the maritime transportation of energy and other goods, and such transportation in turn depends on passage through so-called choke points formed by narrow waterways and straits, and the bridges across them. Collectively called "civilian maritime assets" these areas are considered to be attractive targets for terrorists. Important ports and harbours, especially those with densely populated areas adjacent to them, are also potentially vulnerable. Response measures to protect maritime assets against terrorist acts are therefore under discussion within this CCMS study.

A propos of a logo

A dash of blue - the sea? the sky? a bird?

A few strokes of red ink - an arrow? a signature? a bridge?

Everyone can let his imagination wander; that is the strength and the beauty of a drawing.

For me this logo, in its graphic simplicity, gives an impression of liberty and openness, and at the same time of quiet strength and solidarity.

This symbol of the Istanbul Summit also reflects the main objective of the NATO activities for cooperation in science and environment, which is to create a network of scientists of different backgrounds and different generations, to contribute to the building of a more secure and stable world.

In view of the major role that Turkey plays in this process, it is natural that, on the occasion of the Summit, a special issue of our newsletter should be devoted to Turkey.

Jean Fournet

Limiting earthquake damage
an international effort

While it is not possible to predict when earthquakes will occur, it is possible in many cases to predict high-risk locations accurately and to determine means to reduce damage and casualties, or to provide aid more effectively following an earthquake.

Two destructive earthquakes hit northern Turkey within the space of three months in 1999. An estimated 20,000 people were killed, thousands more were injured and large areas of towns and villages destroyed.

In response to these earthquakes, and in a gesture of solidarity to a fellow NATO member, the NATO Science Committee immediately convened a working group to recommend how the Committee might best assist Turkey in combating the effects of future earthquakes. From this working group stemmed a number of earthquake studies, some of which will be the subject of an exhibition at the summit meeting in Istanbul, and these are highlighted here.

Mapping the Marmara fault

Although the Sea of Marmara is at the centre of an earthquake zone, very little was known about its geological and geophysical structure prior to the 1999 earthquakes. Few scientific studies were available, and there had been no focus on its earthquake risk. Early in 2000, such a study finally began, and it was launched with NATO funding.

There followed an international effort involving Turkey, France, Italy and the United States which has resulted in a complete seismological map of the Marmara fold. By deploying ocean bottom seismometers, eight international research vessels were able to monitor the Marmara Sea fault over a number of years, and develop a picture of the seismic activity. With this knowledge scientists are able to predict the probable strength of an earthquake that is expected to affect Istanbul itself. Thus forewarned, the authorities are already taking steps to re-engineer and strengthen buildings in the high risk zones. The co-directors of the NATO study were Prof. Naci Görür of the Istanbul Technical University, Turkey, and Prof. Xavier Le Pichon, of the Collège de France.

> "Gradually the fault began to reveal its secrets. Mud cores taken from the sea-floor revealed the huge quakes that had struck the area in the past and the seismic signals indicated that the whole area was still very much alive". BBC Horizon programme 'Earthquake Storms' - 1 April 2004

Establishing a national monitoring network

The 1999 earthquakes presented an opportunity to study the seismological effects of a very strong earthquake, and to incorporate the study's results into a new national network in Turkey. Earthquakes of this magnitude in the same region are relatively rare, and by the time of the next occurrence valuable data on their damaging power has usually been lost. The knowledge gained in these recent strong earthquakes, however, has this time been used in monitoring seismic activity in other parts of the fault, and the data have been included in a National Strong Motion Network. The authorities are able to use the network to design and plan appropriate earthquake-resistant facilities. The National Strong Motion Network has been enhanced through NATO Science for Peace funding, which has provided instruments for twenty state-of-the-art earthquake recording stations across the North Anatolian Fault. Prof. Polat Gulkan of the Middle East Technical University's Disaster Management Research Center, and Prof. John Anderson of the University of Nevada, Reno, USA, were the co-directors of the NATO project.

Assessing earthquake impact on urban areas

For urban centres in areas prone to dangerous earthquakes it is particularly important to carry out careful risk analysis and to develop contingency plans and mitigation strategies. A Science for Peace project has provided support for just such studies being carried out for the cities of Tashkent, Uzbekistan and Bishkek, Kyrgyz Republic, both of which have experienced damaging earthquakes, and are likely to do so again. The damage and loss scenarios developed resulted in the production of seismic hazard maps and earthquake ground motion models for

the two cities, which has enabled scientists to estimate the magnitude of future earthquakes. Civil engineers and city planners are able to use the results to develop the type of buildings that could withstand future earthquakes. The collaborators on the project were teams from Bosphorus University, Istanbul, led by Prof. Mustafa Erdik, the Academy of Sciences of Uzbekistan, led by Prof. Tursunbay Rashidov, the Academy of Sciences of the Kyrgyz Republic, led by Prof. A. Turduculov, and the United States Geological Survey, led by Prof. Erdal Safak.

Strengthening existing buildings

The results of the Science for Peace project "Seismic Assessment and Rehabilitation of Existing Buildings" provide engineers with the information they need to decide if a building is likely to be safe in an earthquake or is potentially vulnerable to damage. With this knowledge they can introduce structural seismic safety features before an earthquake strikes. New techniques and innovative materials have been developed, such as panels of carbon fibre reinforced polymers, which can be inserted into existing buildings. Such materials are less costly and easier to install than traditional reinforced concrete infill walls. The project brought together researchers working in the area of seismic assessment and rehabilitation at several major universities from Turkey, Greece, the former Yugoslav Republic of Macedonia[1] and the USA. Prof. Guney Özcebe of the Middle East Technical University was the Turkish project leader.

[1]Turkey recognizes the Republic of Macedonia with its constitutional name

Special Summit Science Prize awarded to Turkish institutes

A special Summit Science Prize will be presented to three Turkish universities on the occasion of the Istanbul summit in June. The three Turkish institutes have been awarded the Prize for achievements in research on prevention of the consequences of earthquakes, and their work in fostering cooperation between NATO and partner countries. Their work is featured on these pages. The three institutes are - Bosphorus University, Istanbul Technical University, and the Middle East Technical university. The leaders of the projects, named above, and their research teams, are to be congratulated on their work.

Civil emergency planning

The Euro-Atlantic Disaster Response Coordination Centre (EADRCC) was established in 1998 to coordinate the responses of NATO member and partner countries to disasters occurring in the Euro-Atlantic region. One of its early responsibilities was to assist with relief operations following the Turkish earthquakes. A major task of the EADRCC during a crisis is to facilitate speedy and effective assistance to a stricken nation. It also serves as NATO's focal point for information-sharing on disaster assistance requests, ensuring that relief groups have accurate and timely overviews of events as they unfold. The EADRCC is just one of the activities of NATO civil emergency planning which will be featured at the exhibition during the summit in Turkey.

Regional partnerships

preventing conflict through discussion and cooperation

Environmental forecasting for the Caspian Sea

Through CCMS, Turkey is leading nine countries to collaborate on establishing a prototype Caspian Basin Observing System, for monitoring key physical and biochemical variables of the Caspian Sea ecosystem. The project aims to demonstrate the need for a network of long-term stations monitoring hydro-meteorological, hydro-chemical regimes and the contamination of the marine environment. Trans-boundary transport issues will be addressed, and environmentally tense or vulnerable regions of the Caspian Sea will be identified. A database on biological parameters of the Sea will be established, in particular to monitor the level of invasion of the predatory jellyfish-like Mnemiopsis ctenophore, which has a devastating effect on the eco-system and the fish-stocks. Training programmes will be established, and methods of improving communication and exchange of data between riparian countries will be identified. A public education programme is envisaged. In addition to Turkey, the countries involved are Azerbaijan, Belgium, Bulgaria, Georgia, Kazakhstan, Russia, Ukraine, United Kingdom, and United States.

Eco-system modeling of coastal lagoons

The concept of sustainable management of lagoons is often either not clearly understood or not applied. Lagoons are the most valuable components of coastal areas in terms of both eco-system and natural capital. Surrounding areas of lagoons provide excellent opportunities for agriculture and tourism sectors on the one hand and for fishery and aquatic products sectors on the other. Lagoons generally face a number of environmental difficulties - for example, dissolved oxygen deficit, variation in trophic structure, aquatic toxicity, filling of lagoons or clogging of channels - and these problems directly affect the tourism, agriculture, fishery and aquatic products sectors. A CCMS pilot study is underway to conduct an integrated lagoon management system, using current proposed methodology of eco-system modeling for sustainable management. With Turkey as lead, the other countries participating in this CCMS study are Azerbaijan, Canada, Italy, Kazakhstan, Kyrgyz Republic, Lithuania, Poland, Portugal, Romania, Russia, Spain, Turkmenistan and the United States.

Limiting oil spill damage

The Security Through Science Programme has made an award to three research laboratories to collaborate on an analysis of the land around an international oil pipeline, with a view to forecasting the degree of stability of the land if there is an emergency flood of petroleum, and to asses its ability for self-cleaning. The Baku-Tbilisi-Ceyhan oil pipeline is due to come into service in 2005 and will open up the oil production of the land-locked Caspian Sea to international shipping lanes through the Mediterranean Sea. The pipeline will pass through Azerbaijan, Georgia and Turkey. Armed with information on the properties of the land in the different regions of the pipeline's passage, remediation procedures can be set up. The grant will strengthen the collaboration between research groups in the three institutions involved in this research - Cukurova University, Turkey, the Institute of Soil Science and Agrochemistry, Azerbaijan, and the Georgian State Agrarian Academy, Tbilisi, Georgia. The co-directors of the project are Prof. Rifat Derici (Turkey), Prof. Magerram Babayev (Azerbaijan) and Prof. Tengiz Urushadze (Georgia).

Science for Peace

strengthening the socio-economic infrastructure of partner countries.

A new phase of Science for Peace has now been launched, with support offered for security-related science projects in Priority Research Topics. Full details of the support criteria for the new phase of SfP can be found at www.nato.int/science.

The first Science for Peace (SfP) projects began their activities in January 1999. The objective was to help strengthen the socio-economic infrastructure of partner countries, and in this way contribute to overall stability and peace. Support was given for applied research and development projects related to industrial or environmental problems. Turkey too was eligible for SfP support.

Record-breaking innovation

A collaborative partnership of Turkish and Russian scientists has resulted in the manufacture of photodetectors and lasers with a world-record high-speed performance. A further collaboration, between Turkish and Romanian scientists, has resulted in the manufacture of infrared chemical pollution detectors of extremely high sensitivity, allowing the detection of minute amounts of pollutants. Bilkent University was the Turkish collaborator involved in this project, which has resulted in the development of new high performance optoelectronic devices, the major components of high-speed optical telecommunication systems. These innovative products are now being commercialized by industrial end-users in the participating partner countries. Project co-directors are Prof. E. Ozbay, Turkey, Prof. E. Portnoi, Russia, Prof. G. Tuttle, USA, Dr. L. Pintilie, Romania.

New fibre materials from polymer gels

Synthetic fibres formed from polymeric materials are widely used in many areas of everyday life, including clothing, and in industrial processes. There is a demand from the industries involved for improvements in both the mechanical properties of the fibres (tensile strength, tenacity, etc.), and the development of fibres with properties such as ability of absorption, antibacterial properties, or deep colour pigmenting. The demands for the high performance of the final product also have to be reconciled with an environmentally friendly way of production. This project has resulted in two important technological achievements. The first was the production of ultrafine elastic fibres having mechanical properties superior to those of ordinary fibres and the second involved development of palladium-containing catalytic microfibres, which increased the catalytic efficiency of the industrial process considerably in comparison with that of the existing catalysts. Project co-directors are Prof. Burak Erman, Turkey, Dr. A. Khokhlov, Moscow, Russia, Dr. P. Khalatur, Tver, Russia and Dr. A. Krylov, Tver, Russia.

Advanced silicon technology

The market for solar (photovoltaic) cells to generate electricity directly from sunlight is growing rapidly and offers great opportunities for international trade. Although Ukraine had experience of producing solar cells for space applications, there was no capability in the country for the large scale manufacture required for terrestrial uses. Turkey was one of the collaborators in this project which aimed to assist Ukraine to develop efficient cells and encourage R&D companies to enter into industrial production. The project has met its objectives. Scientists from the Ukrainian Academy of Sciences developed novel Silicon PV technology and the local end user, KVAZAR Joint Stock Company, has invested in a pilot cell production line that incorporates the new cell designs and is producing high quality cells on a commercial scale. Project co-directors are Prof. M. Tiris, Turkey, Prof. V. Kochelap, Ukraine, Dr. J. Knobloch, Germany, Prof. N. Syred, United Kingdom.

Minimization of pesticide residues on processed products

Apple production, and particularly production for baby foods, is of great economic importance for Turkey. A Science for Peace project is studying the fate of selected pesticides during processing procedures of apple production. Pesticide behaviour changes during processing, and few studies are being done on the removal of pesticides during processing. In addition, pesticide studies are generally carried out on adults, whereas infants and children are more affected than adults by pesticides. The expected results of the project are to reduce the health risks for the Turkish population, and to help the national food production meet the quality requirements of NATO country markets. Project co-directors are Dr. C. Lentza-Rizos, Greece, Dr. U. Kaya, Turkey, Prof. A. Balinova, Bulgaria, Prof. J. Hajslova, Czech Republic, Prof. E. Matisova, Slovakia, Dr. O. Sakaliene, Lithuania.

An appreciation by Turkey's representatives

Professor Dinçer Ülkü, of Hacettepe University, Ankara, is Representative of Turkey on the NATO Science Committee. Professor Nejat Ince, Director of the Centre for Defence Studies, Istanbul Technical University, is Representative of Turkey on the NATO Committee on the Challenges of Modern Society (CCMS). We asked the two representatives if they would like to comment on their country's participation in the Science and CCMS programmes, and offer their thoughts on the role of these two NATO programmes in a changed world full of new challenges.

Professor Ince observed first that the achievements of science and technology, which he termed "technoscience", have changed people's lives in the past century, with much of the change being beneficial. It was all the more surprising, therefore, that despite the achievements of science, the public attitude towards it had remained one of mixed respect and indifference.

He continued by saying that in addition to the support for technoscience in the Science Programme, the application of technoscience to finding solutions to social problems has been used by CCMS since it began in 1969, through the projects introduced to it by member nations. Turkey took an early interest in CCMS, and the interest continues to this day as CCMS adapts to new challenges, such as supporting studies in non-traditional threats to security, for which Turkey is leader for two out of three current studies.

Professor Ince also offered his best wishes to NATO's leaders for a successful meeting as they convened in Istanbul and continued by expressing deep appreciation to the political leaders and scientists "who had the foresight to cultivate within the Alliance the notion that there is more to defence than military preparedness". He reflected that, for those who were able to participate in these NATO activities, one of the real joys was the friendships forged, which led to the removal of barriers to understanding. He concluded by saying:

"In a real sense we are the beneficiaries of the wisdom and steadfastness of all those who have helped build and sustain the NATO Alliance over the years. I hope their example will continue to help guide us as we consider ways to improve, together with our common defence, the qualities of life for future generations."

Professor Ülkü remarked that since the establishment of the Science Committee in 1958 the Turkish scientific community had made full use of the possibilities for collaboration offered by the Programme. NATO Science Fellowships (now replaced by Reintegration Grants) had been particularly appreciated, especially in the opportunities they offered for study in the United States. Most of the young scientists had later assumed important scientific positions on returning home to Turkey. He cited also Collaborative Research Grants (now called Linkage Grants) as having opened up new horizons for researchers who felt scientifically isolated.

He also evoked the success of the former Science for Stability Programme for Turkey, saying that "the Black Sea project alone involved more than 100 young scientists from Turkey, Russia, Ukraine, Bulgaria and Romania. This project is recognized as an important international effort to save the Black Sea."

He noted the Science Committee's special initiative at their meeting in October 1999, following the earthquakes earlier that year, and also recognized the success of the "Virtual Silk Highway" for Turkey's neighbours in the Caucasus and in Central Asia, observing that a Turkish communication satellite was used for the network. In remarking on the most recent re-construction of the Science Programme towards support for security-related topics, he concluded by saying that:

"The most important target of the NATO Science Programme has always been maintaining high scientific standards. Hopefully, this tradition will continue for years to come."

Turkish satellite powers the Virtual Silk Highway

The NATO-sponsored "Virtual Silk Highway", which connects the academic communities of the Caucasus and Central Asia to the Internet, uses a Turkish satellite to provide the network link. The Silk network configuration consists of satellite dishes and network equipment in the eight participating countries, a central distribution point, or hub, with a dish and network equipment in Hamburg, Germany, and a contract with a satellite vendor for Internet access. The Eurasiasat-1/Turksat-2A satellite, in service since February 2001, was the selected operator. The "footprint" of this satellite is perfectly placed for coverage of the area served by the NATO Virtual SilK Highway.

Dinçer Ülkü making a point at a recent NATO meeting and, below, Nejat Ince (left) in conversation with Jean Fournet, NATO Assistant Secretary General for Public Diplomacy, and Chairman of the CCMS and the Science Committee

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