European Geosciences Union

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City of the future?

GIFT - 2007

Geosciences in the city

Geosciences Information for Teachers Workshop

Vienna, Austria, 16 - 18 April 2007

European Geosciences Union
GEOPHYSICAL INFORMATION FOR TEACHERS (GIFT) WORKSHOP
Austria Center Vienna
16-18 April 2007

Geosciences in the City

Dear Teacher,

Welcome to the fifth EGU GIFT Workshop!

70 teachers from 21 countries will attend this 2 and a half day workshop. We particularly welcome teachers from Bulgaria, a new European nation since January 1st, 2007, and teachers from China, all of whom are present for the first time!

The general theme of the 2006 GIFT workshop is "*Geosciences in the City*" – one of the themes of the coming International Year of Planet Earth, a program sustained by UNESCO and different Scientific Institutions throughout the world.

In 1950 30% of the world's population lived in cities. In 2000 it was 47% and this increasing trend still continues: in 2007 more than half of the world's population will live in cities. Urban settings are exposed to pollution created by human activities, such as power plants (emission of CO_2, CO, NO SO_2, soot), traffic (CO_2, CO, SO_x, hydrocarbons, noise..;), industrial plants and water waste and runoff. While the impact of anthropogenic factors are continuous and usually easily understood by the general public, it is not always obvious how geological and natural factors influence our daily life because of their somewhat unpredictable nature (hurricanes, floods, earthquakes, volcanic eruptions…).

The purpose of the GIFT-2007 workshop is to illustrate how all these different factors interact and to make teachers and their students and, through them, the general public aware of the complexity of the environmental problems in urban areas.

Towns such as Rome and Istanbul, because of their long history, geographic/geological location and high concentration of inhabitants, represent areas where exposure and vulnerability to natural hazards are disproportionately high, and will be a main target for the GIFT workshop. In the first part of the workshop, the geological and natural setting of these towns will be discussed, together with the impact of natural hazards on modern cities. In the second part of GIFT-2007 we'll discuss atmospheric pollution linked to high population density and other natural and anthropogenic factors, and the approaches that urban authorities use to mitigate them.

Information and activities that teachers can use in their classrooms to make their students aware of these problems and to stimulate reduction of energy consumption to a minimum, will also be an important aspect of GIFT-2007.

As for the preceding GIFT, presentations will be given by leading scientists present at the General Assembly of EGU. We have also scheduled presentations by teachers to their fellow teachers, following the success of this element in the previous years. Please, don't be shy, if you have something to tell your fellow teachers do it! If you have come to Vienna with a last minute, unscheduled presentation, do not hesitate: tell us about it and we'll try to find a way to discuss it!.

And, please, let us know how you are using the material and ideas from GIFT in your classes: this will be our reward for preparing the workshop! (The list of the members of the Committee on Education and their e-mail addresses is included in this brochure).

Finally, the Committee on Education of EGU is already preparing GIFT-2008. The General theme will most probably be "The Carbon Cycle". Please advertise this workshop among your fellow teachers in your country, to make it as widely known as possible!

Carlo Laj

On behalf of the Committee on Education of EGU

Acknowledgements

The GIFT-2006 workshop has been organized by the Committee on Education of the European Geosciences Union. EGU has supported the major share of the expenses, but the workshop has also benefited of the generous help of:

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The Bjerknes Centre for Climatic Research in Bergen, Norway

The Institute of Geology and Geophysics, Chinese Academy of Sciences, China

And we thank all the speakers who have contributed to this educational workshop and their institutions!

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Committee on Education

http://www.copernicus.org/EGU/info/committee_on_education.html

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Program

European Geosciences Union – General Assembly
GEOPHYSICAL INFORMATION FOR TEACHERS (GIFT) WORKSHOP
Austria Center Vienna

Geosciences in the City

Monday April 16, 2007

08:30 - 09:00 **OPENING OF THE WORKSHOP**

09:00 – 09:15 **A SHORT INTRODUCTION TO NATURAL HASARDS IN URBAN AREAS**
Fausto Guzzetti
President
Natural Hasard Section EGU

9:15 – 10:15 **THE ROOTS OF URBAN GEOLOGY: THE CITY OF ROMA**
Renato Funiciello
Dipartimento di Scienze della Terra
Univeristà Roma-TRE, Italy

10:15 – 10:45 **COFFEE BREAK**

10:45 – 11:45 **A TOWN WITH THE MOST PRECIOUS STONES IN THE WORLD (LIVING WITH GEOLOGY IN ISTANBUL)**
A. M. Celâl Sengör, Necdet Özgül, Mehmet Sakinç and Okan Tüysüz
Istanbul Techical University
Istanbul, Turkey.

11:45 – 13:30 **LUNCH**

13:30 – 14:15 **THE DRAGON'S HEAD STORY: WATER/LAND CONFLICT IN SHANGHAI**
Pinxian Wang
State Key Laboratory of Marine Geology
Tongji University
Shanghai, China

14:15 – 15;15 Teacher – Scientist Collaboration:

HIGH-DENSITY MACROSEISMIC SURVEY IN THE CITY OF ROME
Roberta Rosa, Francesca Cifelli & Francesca Funiciello
Liceo Classico Vivona, and University of Roma Tre

15:15 – 16:30 Teacher – to – Teachers communication:

THE IMPACT OF EARTHQUAKES STUDIED USING A COMPUTER DRIVEN VIBRATING TABLE
François Tilquin and Gilles Baudrant
Earth sciences-Biology and Physics teachers
Abel Dubois, Cathy Labonne, Alison Hoang
Students
Lycée Marie Curie, Echirolles, France.

16:30 – end of day **GUIDED TOUR OF THE VIENNA MUSEUM OF NATURAL SCIENCES**
Herbert Summesberger
or **VISIT THE GENERAL ASSEMBLY OF EGU**

Tuesday, April 17, 2007

08:30 – 09:15 **THE AUGUST 2002 FLOOD IN PRAGUE IN THE CONTEXT OF HISTORICAL AND RECENT FLOODS IN THE CZECH REPUBLIC**
Rudolf Brazdil
Masaryk University, Brno
Czech Republic

9:15 – 10:00 **THE INTERNATIONAL CHARTER SPACE AND MAJORS DISASTERS : A SPACE RESPONSE FOR RISK MANAGEMENT**
Selma Cherchali
Centre National d'Etudes Spatiales
Toulouse, France

10:00 - 10:30 **COFFEE BREAK**

10:30 - 10:45 **A SHORT INTRODUCTION TO ATMOSPHERIC SCIENCES IN URBAN AREAS**
Ulrich Poeschl
President
Atmospheric Sciences Section, EGU

10:45 - 11:45 **MILAGRO MEASUREMENT CAMPAIGN OVER MEXICO CITY METROPOLITAN AREA**
Luisa T. Molina
Massachusetts Institute of Technology and
Molina Center for Energy and the Environment, USA

11:45 - 13:30 **LUNCH**

13:30 - 14:15 **BRINGING MILAGRO SCIENCES TO THE PUBLIC, STUDENTS AND EDUCATORS, THROUGH THE WINDOWS TO THE UNIVERSE WEBSITE**
Roberta Johnson
Education and Outreach, UCAR,
Boulder, CO USA

14:15 – 14:45 **THE COPERNICUS JOURNAL FOR YOUNG SCIENTISTS**
Dick van der Wateren
EGU Press Officer

14:45 – 15:45 Teacher-to-Teachers communications

SPACE AND ENVIRONMENT: CLASSROOM ACTIVITIES FOR THE HIGH SCHOOL
Nicole Herman
Lycée Rooselvet, Reims, France

FROM 1910 TO 2010 : A NEW FLOOD IN PARIS?
(A SCHOOL PROGRAM)
Jean-Raphaël Deutsch
Collège-Lycée Sévigné, Paris, France

15:45 – End of the day **VISIT THE GENERAL ASSEMBLY**

Wednesday April 18 , 2006

09:00 – 10:00 **TOWARDS UNDERGROUND CITIES?**
Eduardo F.J. de Mulder
Executive Director of the International Year of Planet Earth
IYPE Secretariat, NGU, Trondheim, Norway

10:00 - 11:15 TEACHER – TO – TEACHERS COMMUNICATIONS:

THE ECO-VILLAGE CHALLENGE:
A STUDENT INVESTIGATION AND APPLICATION OF ENVIRONMENTAL LAND USE PLANNING
Brittany Neptun
NewTrier High School
Northfield, Ill, USA

SWEET SCIENCE
(Using sweets and biscuits to teach some ideas of geology to lower school students, aged 11-14)
Sue Howarth and Alan Wollhead
Tettenhall College, Tettenhall WV, and Bromsgrove School, Bromsgrove, Great Britain

11:45 – 12:00 **FILLING OF EVALUATION FORMS AND PRESENTATION OF THE GIFT-2008 WORKSHOP**

END OF THE GIFT WORKSHOP

12:00 – 13:30 **LUNCH**

13:30 **ECORD WORKSHOP**

Speakers and abstracts

Fausto Guzzetti, PhD
Geologist
President Natural Hazards Division
European Geosciences Union

Fausto Guzzetti graduated in geology form the University of Perugia, Italy, in 1983 with a thesis on the structural geology of the Central Apennines. In 2006, he obtained a PhD in geography from the University of Bonn, Germany, with a dissertation on landslide hazards and risk assessment. In 1985-86 he was a visiting scientist at the U.S. Geological Survey, working on small-scale landslide inventory maps. Since his return to Perugia in 1987, he has worked on a number of items, including: (1) landslide mapping and landslide cartography in different morphological and climatic environments, (2) analysis of landslide types and patterns in relation to different geological settings, (3) methods for landslide hazard and risk assessment and mapping, (4) comparison of landslide maps, (5) acquisition and use of historical information on landslides and floods for hazard and risk assessment, (6) identification of rainfall and hydrological thresholds for the initiation of landslides, (7) spatially distributed rock fall modelling for hazard assessment, (8) frequency-magnitude statistics of landslides, and (9) dissemination of information on natural hazards and risk. Since 2001 Guzzetti has been a senior research scientist at the Italian Consiglio Nazionale delle Ricerche (CNR), and he presently leads the CNR IRPI Geomorphology Research Group in Perugia (http://palpatine.irpi.cnr.it/Geomorphology). A founding member of the European Geosciences Union (EGU), Guzzetti was president of the Natural Hazards Division of EGU between 2002 and 2007. The author or co-author of more than 40 papers and book chapters, he is an associate editor of the EGU journal Natural Hazards and Earth Systems Science.

A short Introcuction to Natural Hazards in Urban Areas

Fausto Guzzetti
University of Perugia, Italy
President, Natural Hazards Division, EGU

Meteorological and geophysical phenomena such as earthquakes, volcanic eruptions, tsunamis, hurricanes, lightening, floods, landslides and snow avalanches, are the result of natural processes, and contribute to shape the Earth morphology and landscapes. The listed phenomena may become a hazard when they interfere with the human sphere i.e., with the population, the structures, the infrastructure, the societal interests, and the economic assets. It is the presence of human beings and their activities that make natural phenomena potentially dangerous hazards. Investigating natural hazards and their potential risk is important for the design of a sustainable development. A single hazardous event can cause hundreds of thousands of casualties and extreme economic damage. Damage to the population is largest in the less developed countries, where warning systems and emergency planning is lacking, and economic damage is most severe in developed areas, where structures, infrastructures and economic activities are more complex and fragile. Investigating natural hazards involves forecasting the occurrence of future events, and their potentially damaging effects. The forecast of a hazard involves determining where the event will occur, when or how frequently it will occur, and the magnitude of the event, including the type and extent of the expected damage. Despite important similarities, our ability to forecast natural hazards depends on the type of the hazard and of the triggering phenomena. Scientists are capable of predicting where earthquakes are expected, but are less capable of forecasting when earthquakes will occur. Floods occur mostly along rivers, and their temporal occurrence is linked to the triggering events (e.g. intense or prolonged rainfall). Landslides are particularly difficult phenomena to predict, as mass movements can be initiated by a variety of geophysical, meteorological and human triggers. The General Assembly of the European Geosciences Union has a lively and diversified programme on natural hazards. If you are interested in natural hazards, this is the place you want to be.

With grandaughter Flavia

Renato Funiciello
Professor of Structural Geology
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Renato Funiciello was born in Tripoli in 1939. He is Director and Full Professor of Structural Geology at the Dep. Geology Univ. Roma TRE (Italy). His scientific career has been mainly developed on structural geology, volcanology and geothermal research. He has been principal investigator in the NASA international project Apollo and full engaged on analytical teams connected with the Lunar Receiving Laboratory of Manned Spacecraft Center of Galveston, Texas.

Author of more then 200 peer reviewed papers relevant to four main research topics:

- Studies on recent geological features of western Mediterranean area, volcano-tectonics and neotectonics;
- Geothermal studies in Mediterranean areas
- Natural Hazard Studies
- Urban Areas studies

He's also Author of a recent publication by Heiken, G. Funiciello, R. and De Rita, D. (2005), titled "The Seven Hills of Rome", which represent an extraordinary link between urban geology and history.

The roots of Urban Geology: the City of Roma

Renato Funiciello

Dipartimento di Scienze della Terra
Univeristà Roma-TRE
Italy

Rome is a city where planning and management decisions are being made with careful attention to the city's geologic setting. From its time as the historic heart of the Roman world, Rome has been continuously a political, religious and administrative centre. Natural and geological factors made the fortune of this city and assured its population growth, providing natural defences, water resources and abundant materials for construction, roads, and aqueducts. From lessons of urban development and prosperity, Romans developed a capacity to recognize and to manage the natural resources of the region. It is appropriate that the term urban geology has its origin in Urbs, which was the ancient name for the City of Rome. Modern Rome, born after the unification of Italy, is a new city, developed in a chaotic manner and suffering the problems of modern towns. Besides anthropogenic factors (traffic, wastes and acoustic pollution), Rome is exposed to nearly every natural hazard, such as seismic, volcanic and hydrological hazard.

In this talk, the peculiar geological setting of the city will be described together the natural risk to which the city is subject to. The exposure of the town to seismic events will be described in detail, illustrating the long historical record of seismic events that monuments preserved through time. Although the city of Rome is not located in a dangerous seismogenetic area, earthquakes originating from the Apennines are strongly felt, due to the peculiar underling geology. In particular, major seismic effects occur in alluvial deposits of the Tiber River and its tributaries, above which most of the ancient and historical buildings lie.

The case history of Colosseum will be given as an example of how surface geology can influence the stability of buildings during the occurrence of earthquakes. In fact, Colosseum has been built across the boundary between sedimentary and volcanic rocks and the unconsolidated alluvium of a Tiber River's creek. In consequence of the numerous earthquakes that stroke central Italy, Colosseum suffered a differentiated damage. The northern side (built on solid sediments) was lightly damaged during the occurrence of earthquakes affecting the city if Rome, whereas the southern side, overlaying an ancient creek filled with poorly consolidated sediment, was severely damaged by excessive ground acceleration. Another interesting example of how the surface geology influence the stability of buildings come from two of the most famous columns in Rome: the Trajan column and the Marcus Aurelius column. These two columns

present many similarities: they were constructed in the same period (second century A.D.), with similar size, materials and same techniques. The only difference is that they lie on different deposits, the Marcus Aurelius column on Tiber alluvial deposits and the Trajan column on consolidated continental sediments. As a consequence, during the occurrence of earthquakes that stroke Rome, the Trajan column was not damaged, whereas in the Marcus Aurelius column the ground motion caused the offset in the marble cylinders that make up the column.

It is important to note that today more than 3 millions people live in Rome, and many buildings have been constructed along the alluvial deposits of the Tiber and its tributaries. If we consider the priceless artistic and archaeological heritage owned by the city, the historical centre characterized by extremely vulnerable ancient buildings and the high concentration of inhabitants, it is very clear that seismic risk is very high in these zones.

Besides the seismic risk, floods and subsidence phenomena will be also described in order to completely illustrate the exposure of the city to natural risk.

In conclusion, it is worth to note that in the past most urban planning decisions were made with little or no regard for the role of the natural setting in the city's long-term heath and stability. An understanding of geology has been shown to have a huge impact on urban management. Most residents have not been pleased with the results of rapid development, but have developed a strong awareness for a need to care for the city and to better manage its environment. There are new, detailed geologic maps of the city, programs for engineering and environmental geology, and cooperative work with archeologists-all within the city and regional governments. Applying science and technology to the urban condition is mandatory thinking as we move into the future.

A.M. Celâl Sengör
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Celal Sengör was born in Istanbul on 24th March 1955. He graduated from Robert Academy in 1973 and as geologist from the State University of New York in 1978. He obtained an MSc in 1979 and a PhD in 1982, both in geology, from the same university. In 1981 he was appointed as assistant to the Chair of Geology in the Faculty of Mines of the Istanbul Technical University. In 1984 he was given the President's Award of the Geological Society of London (the first foreigner to receive this honour) and in 1986 he became a laureate of the Science Prize of TUBITAK, the Research Council for Science and Technology of Turkey (to date the youngest recipient). In the same year he was promoted to Associate Professorship in the Istanbul Technical University, Faculty of Mines, Department of Geology. In 1988 he was honouerd by the University of Neuchâtel in Switzerland by the award of an honorary doctorate (*Docteur ès sciences honoris causa*). In 1990, he was elected to the *Academia Europaea* as the first Turkish member; in the same year he became a correspondent of the Austrian Geological Survey (*Geologische Bundesanstalt* in Wien). In 1991 he was elected an Honorary Member of the Austrian Geological Society. In the same year he was given the 'Era of Knowledge' Prize by the Ministry of Culture in Turkey. In 1992 he was promoted to full professorship in his old institution. In 1993 he was appointed by the government as one of the 10 founding members of the Turkish Academy of Sciences, became a member of the Academy Council and was also elected a member of the Science Council of TUBITAK. 1994, he became a member of the Russian Academy of Natural Sciences and was elected to honorary membership by the Geological Society of America and the Geological society of France. In the same year he was given the Rammal Medal jointly by the *École Normale Supérieure* Foundation and the Physical Society of France. He was honoured in 1997 by the *Grand Prix* for the Earth Sciences (the *Prix Lutaud*) by the French Academy of Sciences in Paris. In 1998 _engör gave a course of lectures on the French contributions to the development of tectonics in the 19th century and received the Medal of the *Collège de France* on 28th may 1998. In 1999 The Geological Society of London awarded him the Bigsby Medal. In 2000 he became the first Turkish foreign associate elected to the U.S. National Academy of Sciences. In the 2004-2005 academic year, _engör occupied the International Chair in the *Collège de France* and received the Medal of the Collège de France on 20th March 2005 for the second time. In 2006, he was elected for a three-year

term as honoray member of the *Muséum National d'Histoire Naturelle* in Paris. In 2006, he was elected a foreign member of the Russian Academy of Sciences. Sengör was a guest professor in Caltech, University of Oxford and in the Paris Lodron University in Salzburg.

Sengör has been mainly known for his international studies on structural geology and tectonics. On these topics he published 11 books, 187 scientific papers, 143 abstracts and numerous popular science articles.

Sengör was married in 1986 to Oya Maltepe and his only child, H. C. Asim _engör, was born in 1989. Professor _engör speaks English, German and French in addition to his mother tongue.

A Town with the most precious stones in the world
(Living with Geology in Istanbul)

A. M. C. Sengör, Necdet Özgül, Mehmet Sakınç and Okan Tüysüz
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The 18th century Ottoman poet Nedim said that even a single stone of Istanbul was so precious that he would not exchange it for the whole of the Persian Empire. What makes this extraordinary city, which Philipp Mansel said is 'the World's desire', so attractive? It is a series of geological accidents that have given the city its rocks (and thus the building materials), its water, its climate, its geomorphology and its historical location.

The oldest settlement we know of dates from 400 ka ago in the Yarımburgaz cave just outside the city limits in the Eocene nummulitic limestones. since then the present-day area of Istanbul has been continuously inhabited. The oldest city in the world? Perhaps. But before it became a city it was part of a rift valley (±450 Ma ago), then a continental margin (450-380) and then a part of a foreland fold-thrust belt (380-320?) of the Scythides. This gave the city its solid foundation within the Theodosian walls.

The Mesozoic is not represented in Istanbul except as volcanic and subvolcanic arc rocks (mainly andesites) with ages from 80 to 65 Ma. An entire volcano is preserved in the N outlet of the Bosphorus and numerous feeder dykes cut the Palaeozoic massif within the present-day city limits. There are now inactive normal faults in the city and these may have been associated with the opening of the Black Sea in the medial Cretaceous.

The Tertiary begins with the Nummulitic Eocene and the grand coral reefs in life positions west of the Theodosian walls still supply building stones to the city. The Neogene is Paratethyan and some its facies are hardly distinguishable from those of the Vienna Basin. It is this Neogene that reaches the walls in an unconformable position on the older foundation and provides (even today!) building stones to these venerable ramparts.

The Quaternary is represented by the Bythinian erosion surface and the now-inverted old valley floors filled with ancient alluvium.The activity of the North Anatolian shear zone, eventually to narrow into the North Anatolian Fault, has imposed since the late Miocene-Pliocene a northwesterly trend on many of the young faults that control the major waterways and natural reservoirs around the city, but all these faults are now essentially dead.

The major natural threat to the city comes from the active north Anatolian Fault that now threatens it with a minimum Mw 7 earthquake in the next half century with a 60 to 70 % probability. Rapid overpopulation, product of blind populist policies since 1950, rampant corruption and a generally poorly-educated populace are the major human threats to the city irrevocably wasting its natural resources.

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Pinxian Wang was born in Shanghai in 1936. He graduated from the Moscow State University in 1960, majoring in paleontology, and was Alexander von Humboldt Fellow in 1981-82 in Kiel, Germany. He is now Professor at the Tongji University, where he was Director of the Department of Marine Geology and the Laboratory of Marine Geology for years. His research activities are mainly devoted to paleoceanography and micropaleontology in the Western Pacific and paleo-monsoon studies in East Asia, especially in the South China Sea. He was co-chief scientist of the Ocean Drilling Program Leg 184 to the South China Sea in 1999 and the Marco Polo Cruise to the South China Sea in 2005.

He has promoted China's involvement in international deep-sea programs and founded the series of "Asian Marine Geology Conferences". He is Member of the Chinese Academy of Science, Honorary Fellow of the Geological Society London, and Milutin Milankovic Medalist of EGU in 2007.

The Dragon Head's story: Water/Land Conflict in Shanghai

Pinxian Wang
(State Key Laboratory of Marine Geology, Tongji University, Shanghai, China

In China, the Yangtze (Changjiang) river is often likened to a "Dragon" because of its length and importance, and Shanghai is considered the Dragon's Head because of its location and it's leading role in China's economy. Making up only one thousandth of China's total land area and one hundredth of China's total population, Shanghai contributes more than one tenth of the country's revenue. Historically, Shanghai was under sea water, and its eastern part has emerged only a thousand years ago because of the propagation of the Yangtze delta. With the industrial development since the last century, the city has been confronted with new challenges of land subsidence mainly caused by ground water over-pumping.

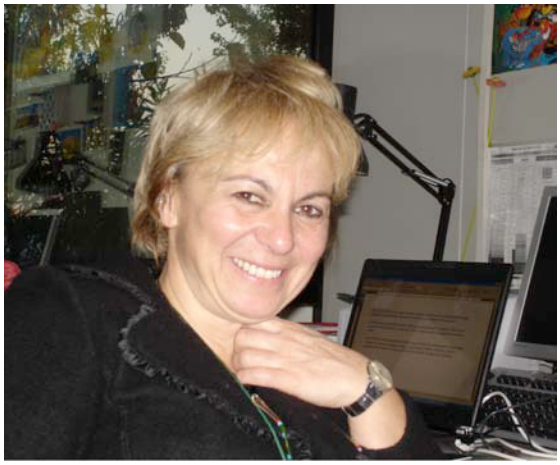
Shanghai is located in the Yangtze delta plain with an average altitude of 3-5 m. Underlain by unconsolidated Quaternary deposits over 300 m in thickness, the city is highly susceptible to both sea level rising and land compression. Land subsidence in Shanghai was initially reported in the early 1920s, but subsidence became a real hazard in the 1950s when the ground water was extensively exploited for cooling in summer by the newly developed industry. In 1963, for example, a total of 200 million cubic meters of ground water was used in Shanghai. Land subsidence reached 38 mm per year in the late 1950s and early 1960s, with the maximal value of 110 mm/year during 1957-1961. The total amount of subsidence measured 1.75 m from 1921 to 1965 and locally reached 2.63 m, bringing about serious consequences ranging from land cracking, buildings leaning over to tidal flooding of the city.

Starting in 1965, the local government has introduced a series of measures to slow down if not prevent land subsidence in Shanghai. Firstly, it restricted the ground water pumping, particularly in the downtown area. The amount of water pumping was reduced from $2x10^8$ m^3 in 1965 to ~$0.8\ x10^8$ m^3 now. The second measure adopted was artificial recharge of ground water. The ground water users are requested to inject the same quantity of water into aquifers in winter as they pumped out in summer. This proved to be a very effective engineering measure. Thirdly, the industrial use of ground water was moved from the downtown to the suburbs, and the water extraction

was moved from shallower to deeper aquifers. Fourthly, a monitoring network of land subsidence and ground water levels was established, and a research centre was set up. These integrative measurements were successful, and the subsidence rate declined in 1966. Since the 1990s, the annual amount of subsidence has been controlled to about 10 mm/year. Without the above efforts, most of Shanghai would have been submerged under sea water in the year 1999 given the rate of subsidence before the 1965.

Nevertheless, land subsidence remains a major issue for Shanghai. On the one hand, the massive construction of high buildings has become a new challenge for land stability. Second, the economic development of the entire Yangtze Delta caused land subsidence outside Shanghai which is beyond its control. As each millimeter of land subsidence costs Shanghai as much as 20 million US Dollar, it is too expensive for the city to ignore the challenge.

As a Dragon Head, Shanghai has been “drifting along” on the water surface. Within the last tens of thousands of years, the Shanghai area has experienced repeated emergence / submergence cycles, and within the last decades it has still been confronted with the struggle between water use and land subsidence. Shanghai reclaims land from the sea, but risks losing land by using ground water, and from the enhanced coastal erosion caused by the upstream damming. Therefore, the story of Dragon Head is continuing…



Roberta Rosa

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My name is Roberta Rosa. I graduated from University in Biology and I work in Rome as a science teacher in a high school. I teach Chemistry, Biology and Earth Science to students 16-to-18 years old.

In the last years my principal interest has been the vocational guidance for students in the last year of high school and have to choose University Faculties. In particular, I follow students interested in scientific studies.

I'm involved in urban areas geological studies. As a teacher, I think that students have to know the territory where they live and they must be guided in "reading" the natural environment hidden by anthropogenic activity. I cooperate with University researchers and in the past we have joined our energies to carry out a macroseimic survey in the city of Rome in order to analyse the intensity distribution of earthquakes in relation to near-surface geology. Results were very encouraging and underlined how the cooperation between researchers and high schools teachers and students gives an important contribution to understand the territory in which we live.

I tried to popularise Earth Science by writing scientific school manuals for high school students.

Francesca Cifelli

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Francesca Cifelli is a paleomagnetist with a geologic formation. She has studied in Roma and obtained her University degrees and PhD there.
Her major research interests deal with the geodynamics of the Mediterranean Basin, with magnetic fabric analysis of sediments and also with high-density macroseismic investigations in urban areas. She has a particular interest in the Calabrian Arc and Sicily (Italy), Betics (Spain), the Moroccan Rif and the area around Roma. She has published 15 articles in international scientific journals.
Her educational activities include university lectures and practical teaching in the paleomagnetic laboratory,

Together with Francesca Funiciello, Francesca is active in special training in scientific management of Science Museums and Sciences Center (these are organized by the "Centro Musei delle Scienze Naturali and "Città della Scienza" Napoli.
And both are scientific advisors to the Museo Storico-Naturalistico, Riviera Parco d'Ulisse (Gaeta, Italy).

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Education

Dip. Scienze della Terra, Univ. "La Sapienza" Rome (Italy)
PhD in Geophysics at the Institute of Geophysics ETH, Zurich (Switzerland)
Post Doc Dip. Scienze Geologiche, Univ. "Roma TRE", Rome (Italy)
Winner of the 2006 European Science Fondation (ESF) Award for European Young Investigator (EURYI) with the project "*Convergent margins and seismogenesis:defining the risk of great earthquakes by using statistical data and modelling*"

Research interests:

Topics:
– Dynamics of subduction zones
– Mantle convection
– Back-arc extension and magmatism
– Mantle plumes
– Post glacial rebound
– High-density macroseismic survey in urban areas

Methodologies:
Laboratory modelling, numerical modelling, analysis of geological and geophysical data.

Areas of Particular Interest:
Mediterranean, Japan, South America.
Author of about 20 articles in international scientific journals.

Educational activities:

– University lectures and practical courses on laboratory modelling.
– Co-referee in Master and PhD theses in Experimental Tectonics.
– Responsible of the refresher course "Scuola Sicura" for teachers of the secondary public schools in Roma and province, Italy.
– Special training in scientific menagment of Scientific Museums and Science Centres, organized by the "Centro Musei delle Scienze Naturali" and "Citta' della Scienza", Neaples (Italy).
– Scientific advisor of the Geo-Paleontological Museum ("Museo Storico-Naturalistico") Riviera Parco d'Ulisse (Gaeta, Italy).

High-Density Macroseismic Survey in the city of Rome

Roberta Rosa
Liceo Classico F. Vivona, Roma
and
Francesca Cifelli & Francesca Funiciello
Dipartimento di Scienze della Terra
Università Roma-TRE

Inhabitants of the city of Rome were aware of many of the shocks occurring during the September 1997-April 1998 Umbria-Marche (Central Italy) seismic sequence, in an area located more then 100 km North of Rome.

In order to provide a macroseismic contribution for microzoning purposes and for the identification of site effects in the city of Rome, a joint project was developed among the University researchers and High-school teachers. The goal of the project was to develop a procedure for high-density questionnaire surveys in metropolitan areas, being aware that human response to ground shaking, when averaged over a large number of samples, is a very useful discriminant of the level of ground motion. High schools students (14-19 years old) from about 30 schools were involved in a high-density macroseismic survey, carried out just after the occurrence of the main shocks. Basically, high schools represent a large catchment area and can be considered representative of the city population. In addition, high school students are supposed to be more capable of understanding the complexity and the scientific meaning of the survey.

On the basis of their geographical location, 10 high schools were selected for the survey performed following the 14 October 1997 earthquake, collecting 1222 questionnaires within two weeks of the event. Following the 26 March 1998 earthquake, the macroseismic network was extended to cover 27 high schools. Under the guide of their teachers, students were requested to complete a revised version of the questionnaire routinely used by the National Institute of Geophysics and Volcanology (INGV).

In this talk, the full experience of the high-density macroseismic survey in the city of Rome will be described. Results prove that the macroseismic survey method can be quickly and successfully performed in a large city, producing a statistically significant high-density of intensity points and yielding useful information about modern suburban areas. Furthermore, the cooperation between research institutes and public high schools can join scientific results with didactical developments in the field of earthquake preparedness, representing an efficient tool to create a permanent macroseismic network.

François TILQUIN

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I am a biology and geology teacher in a high school near Grenoble and students are 15 -18 years old. I am the author of various teaching software and pedagogical applications: data acquisition with interface, simulations, numerical and analogical modelisations in biology and geology. Three examples could illustrate my work in earth science.

In geology, I developed a ground water analogical model with an aquarium and sand, able to simulate water exchanges between land and rivers. Different pollutions can be simulated, with hot water or sodic (KOH) water, and be measured with interface and sensor in different places in the aquarium. These experiments allow to simulate exchanges between land and draining rivers, filtering rivers or pumping stations. They also show the consequences of human activities on the level and quality of ground water.

I have also developed an approach for determining the position of an epicentre in the classroom. The experiment consists in measuring ground's vibrations with microphones, connected to 8 interfaces, which are considered as seismic stations. The vibration of the seism is generated with a hammer's shock on the ground. Students have to imagine a method to determine the epicentre and realize the necessity to have a time synchronisation between each seismic station. The time of arrival of the seismic wave is measured in absolute time, and students are able to locate epicentres by using a specific method (half plane method), to give the arrival time and wave's speed in the ground.

After these experiments, students understand how scientists build world earthquake's maps. Prevention against seismic alea becomes then more reliable.

The last example consists in a model vibrating table to simulate earthquakes on buildings and different Para seismic systems. Vibrations are produced with a low frequency generator, or a numeric-analogical converter of real seismic traces, and are applied on a vibrator. This system will be presented during the GIFT workshop.

I am developing now, some geological applications with two new and free powerful softwares: Goggle Earth and Goggle Sketchup that allow doing 3D geology, with pictures and 3D models overlays.

With all these systems, geology is more visible than previously imagined, and teaching geology becomes, therefore, easier.

The impact of earthquakes studied using a computer driven vibrating table

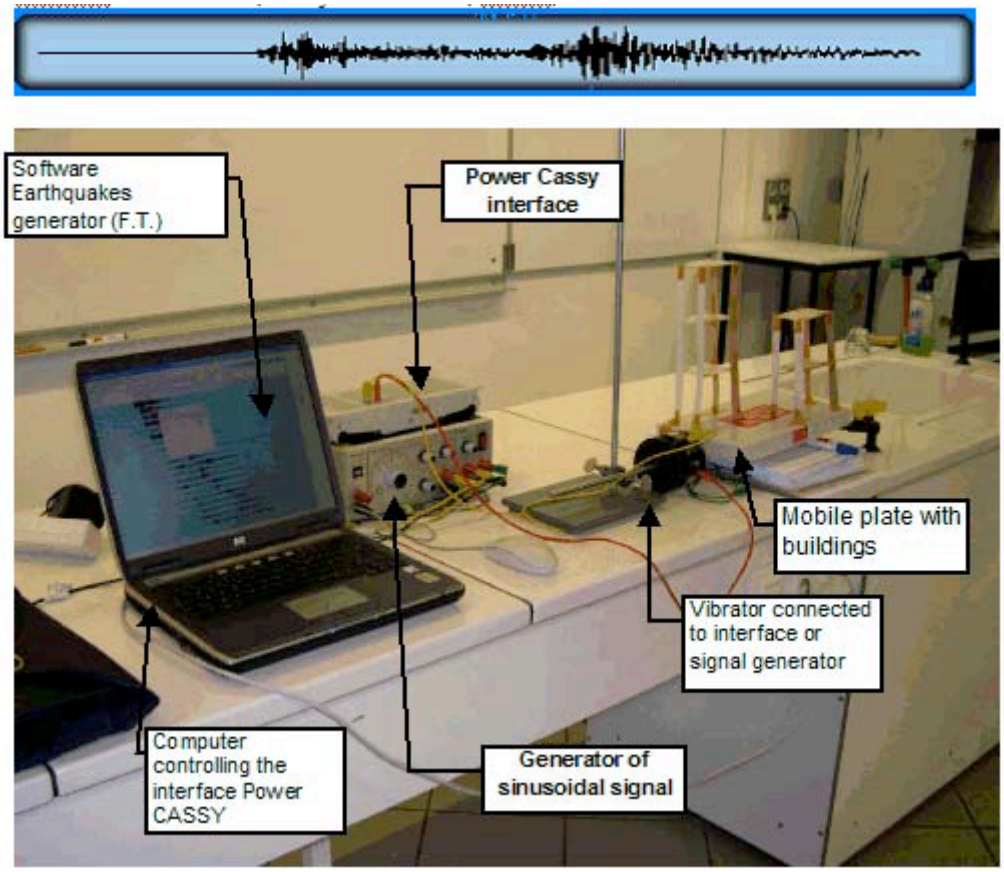
François Tilquin and Gilles Baudrant
Earth sciences-Biology and Physics teachers)

Abel Dubois, Cathy Labonne, Alison Hoang
Students:
Lycée Marie Curie, Echirolle, France

We make use of simple experiments of micro-earthquakes, carried out on models of buildings and intended to show the risks related to seismic zones and the nature of the prevention of these risks in the paraseismic construction.

These experiments are made with some basic material in physics teaching, such as a vibrator (for sound study) and a low frequencies generator. Real seismic traces can be sent to the vibrator with the computer (using a specific software and an interface with a digital to analogic converter). This vibrator is connected to a rolling plate on which some cardboard buildings are fixed.

A lot of experiments can be done, with some "badly built buildings", and solutions to prevent their falling down, or some ground liquefaction with wet sand and buildings.
All experiments and movies can be found at:
http://www.ac-grenoble.fr/webcurie/bio/seismes

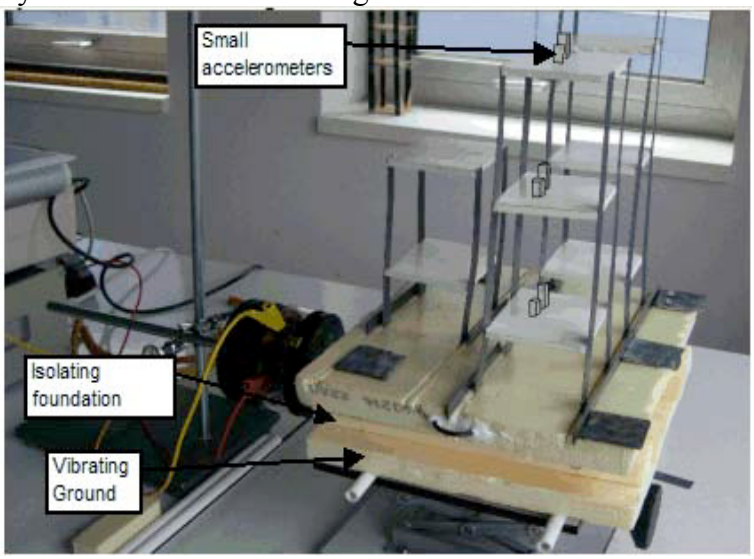


This picture shows experiments of micro-earthquakes, carried out on models of buildings and intended to show the risks related to the seismic zones and the nature of the prevention of these risks in the paraseismic construction.

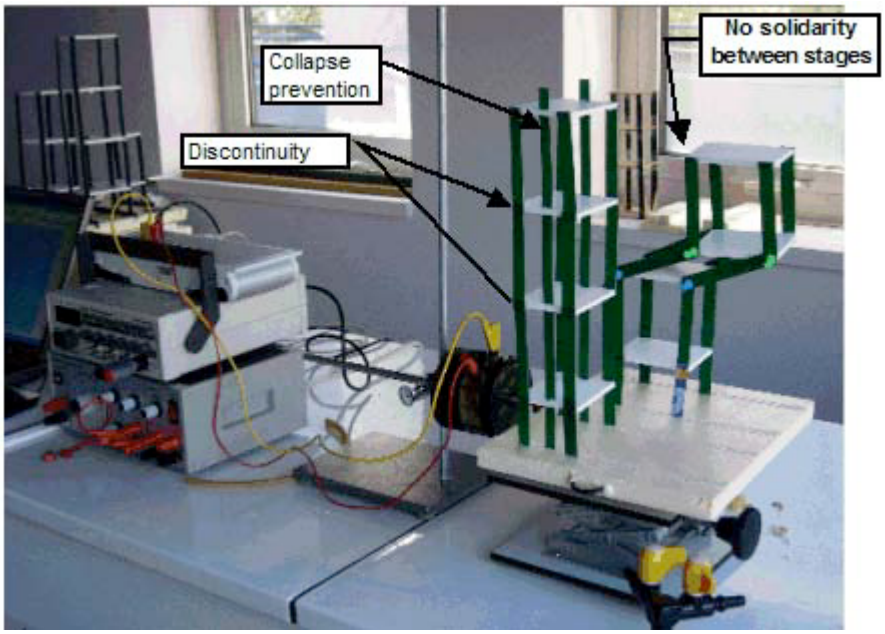
The buildings can have different sizes and more or less fragile structures and it's possible to reinforce the structure with various systems and protect buildings with flexible foundations.

The phenomenon of resonance amplifies buildings' vibrations, and that system makes it possible to find the good solution to avoid its collapse.. The system allows to demonstrate a large variety of complex physics problems.

Systems to measure buildings accelerations at various levels



Small parallelepipeds are calculated to fall to various accelerations. The building is isolated from the ground with some rolling system.

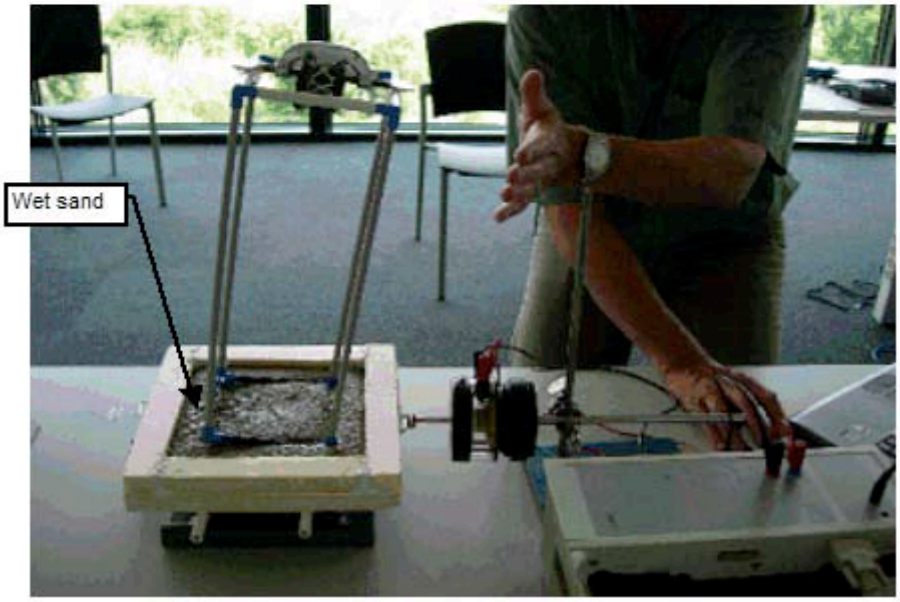


Protection against collapsing with bearing walls.

Ground's liquefaction:

This system also makes it possible to show the phenomenon of ground's liquefaction of the which results in a swing of the buildings in the ground which is liquified during earthquake.

Photo DR ESSONE



Ground heterogeneity and liquefaction: building falls.

Rudolf Brázdil
Masaryk University
Bro, Czech Republic

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Rudolf Brázdil was born in 1951 in Brno (the Czech Republic). He is a professor of physical geography at the Masaryk University of Brno, the Czech Republic. He is doing research in instrumental and historical climatology with a special attention to climate variability and change as well as to climatic anomalies and hydrometeorological extremes, including their impacts. He has published more than 240 scientific papers and books from mentioned research fields. In 1985, 1988 and 1990 he participated in polar expeditions to Spitsbergen. In 1992/1993 he was an invited professor at the ETH Zürich, Switzerland. He is a chairman of the Czech National Geographic Committee and a full member of Commission on Climatology of the International Geographical Union.

The August 2002 flood in Prague in the context of historical and recent floods in the Czech Republic

Rudolf Brázdil
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The August 2002 flood was probably the most disastrous event in the Czech Republic during the past 1,000 years. The paper presents results of analysis of flood series in the instrumental period for the Vltava-Prague (1825–2003) in comparison with floods for the Elbe-D__ín (1851–2003) and the Oh_e-Louny (1884–2003) in Bohemia. Sea level pressure patterns based on Principal Component Analysis are investigated for floods of the winter synoptic type (snow melting, ice damming) and of summer synoptic type (heavy precipitation). There is a significant decrease in the number of floods and their severity (expressed by a return period of maximum peak discharges) from the 2nd part of the 19th century to the end of the 20th century. It is consistent with global warming with significant decrease in the number of winter floods. Documentary evidence (e.g. narrative reports, newspapers, watermarks) allow extension of above series of floods into the pre-instrumental period to be presented in decadal frequencies since the 15th century. Besides the 2002 event, the most disastrous flooding events in Prague and Bohemia during the past millennium were recorded in the years 1118, 1432, 1501, 1598, 1655, 1675, 1784, 1845, 1862, 1872, 1890. Synthesis of documentary and instrumental floods shows long-term flood trends with maximum of floods during the 19th century and the 2nd part of the 16th century. The 20th century belonged to relatively very quiet periods.

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Selma Cherchali was born in 1966. She received the Ing. Diploma Degree in Signal Processing in 1989 and a Master (DEA - Diplôme d'Enseignement Approfondi-) in 1990 from the ENSEEIHT "Ecole Nationale Supérieure d'Electronique, Electrotechnique, Informatique et Hydraulique de Toulouse", France. She obtained the PhD degree in Remote Sensing at UPS "University Paul Sabatier " of Toulouse in 1994. Thereafter, she worked as engineer in CSIRO at Land and Water division in Canberra, Australia. From 1997, she worked as project manager and head of Elearning Department at GDTA in Remote Sensing Applications, a subsidiary of CNES. Since 2003, she has been working at CNES, within the "Image Products and Analysis" Unit. She is in charge of the activities and projects dealing with Risk management and GIS. She is Project Manager of the "General Services" cluster within the PREVIEW FP6 project, which deals with Rapid Mapping , Assets Mapping and Damage Estimates.

The International Charter Space and Majors disasters :

A Space Response for Risk Management

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Centre National d'Etudes Spatiales,
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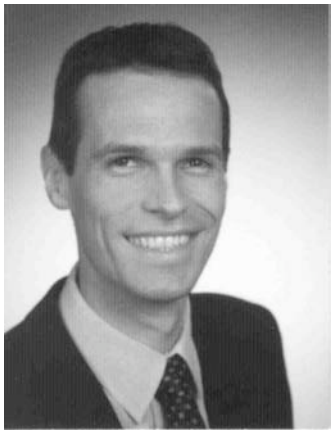
Satellite data are mandatory as a basis for critical information to help the authorities to better assess the scope of a crisis, to measure the extent of the event, the impact in terms of affected population and damaged building/installations/facilities, to precisely map the affected areas in order to organise and plan the rescue: valid access (roads), not affected area to settle rescue sites (hospital). The International Charter (through the space agencies which are members of the Charter) aims at providing a unified system of space data acquisition and delivery to those affected by natural or man-made disasters through Authorized Users.

The presentation, through concrete examples of past disasters (such as the Pragua Floods 2002) will show the space products delivered during the crises. After such a large catastrophic event, rapid mapping, damage observation and damage estimate are always requested, as quickly as possible using satellite data. Some examples will be shown and it will be demonstrated that to be efficient, those services have to be delivered in a very short time, right after or during the crisis. These services are being implemented in the context of GMES (Global Monitoring of Environment and Security.



Ulrich Pöschl
European Geosciences Union, President of the Atmospheric Sciences Division and Chairman of the Publications Committee
Max Planck Institute for Chemistry, Research Group Leader

Ulrich Pöschl is heading a research group at the Max Planck Institute for Chemistry, Biogeochemistry Department, in Mainz, Germany (www.mpch-mainz.mpg.de).
He has studied chemistry at the Technical University of Graz, Austria, and he has worked as a postdoctoral fellow, research scientist, group leader, and university lecturer at the Massachusetts Institute of Technology, Departments of Chemistry and of Earth, Atmospheric, and Planetary Sciences; at the Max Planck Institute for Chemistry, Atmospheric Chemistry Department; and at the Technical University of Munich, Institute of Hydrochemistry.
His current research and teaching are focused on the properties and interactions of aerosols and their effects on atmospheric chemistry and physics, the biosphere, climate, and public health (field measurements, laboratory experiments, and numerical modelling).
In collaboration with a globally distributed network of co-editors, Ulrich Pöschl has initiated and established the successful interactive open access journal *Atmospheric Chemistry and Physics* (ACP, www.atmos-chem-phys.org). For the European Geosciences Union (EGU, www.egu.eu) he serves as council member and president of the Atmospheric Sciences Division and as chairman of the publications committee.

A Short Introduction to Atmospheric Sciences in Urban Areas

Ulrich Pöschl
Max Planck Institute for Chemistry, D-55128 Mainz, Germany

Atmospheric composition and processes are of central importance for climate, the biosphere, and public health. Gases, aerosol particles, and clouds control the Earth's energy balance and hydrological cycle. Moreover, they play important roles in the reproduction of biological organisms and can cause or enhance diseases.
Anthropogenic pollution has a strong influence on atmospheric chemistry and physics, and urban areas are important sources of atmospheric pollutants. Due to very high levels of human activity and population density, megacities are the locations where air pollution has maximal effects on public health, and they also have a strong influence on atmospheric composition and processes on regional and global scales. Key aspects, scientific questions, and research activities on the subject will be outlined.

Luisa T. Molina

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Luisa T. Molina currently is the President of the Molina Center in Energy and the Environment (MCE2), La Jolla, California and Principal Research Scientist in the Department of Earth, Atmospheric and Planetary Sciences at the Massachusetts Institute of Technology.

Her research interests include molecular spectroscopy, chemical kinetics, and atmospheric chemistry. She has been involved in particular with the chemistry of stratospheric ozone depletion and urban air pollution. Recently she initiated a multi-disciplinary project involving an integrated assessment of air pollution in megacities, aimed at improving the environmental decision making process through education and the better use of scientific, technical, and socio-economic understanding. In the spring of 2003, she led a team of about 100 researchers from more than 30 institutions in Mexico, the U.S. and Europe to conduct field investigation of the air quality in Mexico City Metropolitan Area (MCMA). In March 2006, she led a follow-up field measurement campaign MCMA-2006, one of the components of MILAGRO (Megacities Initiative: Local and Global Research Observations), the largest field measurement campaign ever attempted to study megacity air pollution and its regional and global impacts. She is the author or co-author of over 100 archival publications, including editor/lead author of the book entitled, Air Quality in Mexico Megacity: An Integrated Assessment.

MILAGRO Measurement Campaign over Mexico City Metropolitan Area

Luisa T. Molina
Massachusetts Institute of Technology and
Molina Center for Energy and the Environment, USA

About half of the world's population now lives in urban areas because of the opportunities for better jobs, access to city services, cultural and educational activities, and a desire for more stimulating human interaction. At the same time, many of these urban centers are expanding rapidly, leading to the growth of cities and megacities, which are defined as metropolitan areas with populations exceeding ten million inhabitants. Population growth and increasing industrialization have inevitably resulted in a higher demand for energy, greater use of fossil fuels, and more emission of pollutants into the atmosphere. As a result, air pollution has become not only one of the central environmental problems of the century, but also presents serious health consequences to people and economic costs to society.

The main pollutants emitted into the atmosphere in megacities are carbon dioxide, sulfur oxides, nitrogen oxides, carbon monoxide, volatile organic compounds, metal oxides, and atmospheric particles (aerosols) mostly consisting of soot or black carbon, sulfates, nitrates, and organic matter. Currently, the use of fossil fuels in transportation, the generation of electricity, and industrial processes represent the primary sources of pollutant emissions. Once released into the atmosphere, pollutant gases and aerosols are mixed into and transported throughout the atmosphere without regard to geopolitical frontiers, until they are removed by physical and chemical processes. In many cases, the pollutants can undergo chemical and physical transformations that are driven by sunlight leading to the formation of oxidants and secondary aerosol species. The length of time that the pollutants remain in the atmosphere and the meteorology determine the range of their impacts.

These exported primary pollutants and their reaction products have the potential to affect human health and ecosystems on large geographic scales, and additionally can affect atmospheric visibility, weather systems and precipitation, and global climate. The geographic re-distribution of pollutants, the evolution of their chemical, physical, and optical properties, and the mechanisms for their eventual removal from the atmosphere are very complex and obviously important, yet only partly understood at the present time.

MILAGRO (Megacity Initiative: Local and Global Research Observations) is the first international effort to study the impact of a megacity on air quality. The Mexico City Metropolitan Area (MCMA) – the second largest megacity in the world – was selected as the initial case study for MILAGRO. Previous research on air pollution associated with the MCMA provided a framework for planning of future field studies, particularly the MCMA-2003 Campaign. Specifically, it showed that the atmosphere of the MCMA contains high level of aerosols and is extremely active photochemically; it is ideally suited for understanding the atmospheric chemistry of tropical megacities.

More than 150 institutions from Mexico, United States and Europe participated, and over 450 investigators and technicians from 30 different nationalities participated in the MILAGRO campaign in March 2006, organized under four components:

(1) MCMA-2006 (México City Metropolitan Area - 2006) - examine emissions and boundary layer concentrations within México City, the exposure patterns and effects on human health and the evaluation and design of policies intended to reduce pollutant levels.
(2) MAX-Mex (Megacity Aerosol Experiment in México City) - examine the properties and evolution of aerosols and gas-aerosol interactions in the immediate urban outflow.
(3) MIRAGE (Megacity Impacts on Regional and Global Environments) - examine the evolution of the México City plume on larger regional scales.
(4) INTEX-B (Intercontinental Chemical Transport Experiment – Phase B) - study the evolution and transport of pollution on global scales.

The scientific protocol consisted of a month-long series of carefully coordinated observations of the chemistry and physics of the atmosphere in and near México City, using a wide range of instruments at ground sites, on aircraft and satellites, complemented by meteorological forecasting and numerical simulations. Together, these research observations provide the most comprehensive characterization of México City's urban and regional air pollution.

The MILAGRO participants worked side-by-side to collect the data during the observational phase in March 2006, and will continue to collaborate over the next several years to interpret the results. Additionally, MILAGRO has created a vigorous educational program with the participation of many students from universities in México and other countries, and by organizing lecture series, tours, and exhibits for the general public.

This talk will describe the driving forces behind the formation and growth of megacities, impacts of emissions and the ambient concentration of pollutants on the health of the populations, visibility, ecosystems, climate change, and global pollutant transport. The comprehensive measurements that took place during the MILAGRO Campaign and some preliminary results as well as some anticipated results will be presented. The impact of new science on the megacity air pollution problem would be brought in with regard to potential improvements in monitoring, in the use of air quality models to make predictions of the consequences of emission sources, to enable better strategies to reduce emission, and to improve control strategy evaluation.

In conclusion, megacities present a major challenge for the global environment. Air pollution has serious impacts on public health, causes urban and regional haze, and has the potential to contribute significantly to climate change. Air pollution science has progressed steadily in recent decades due to improvements in the ability to measure pollutants, precursors, and reactive intermediates. This information has facilitated the development of improved computer models of the complex photochemistry that forms O_3, other oxidants, and secondary PM. These scientific advances motivate further research to gain a better understanding of how air pollution is formed in megacities and how best to control it. Field measurement campaigns such as MILAGRO focused on the characterization of the outflow of air pollutants from megacities will provide insights on their regional and global impacts.

Dr. Roberta Johnson
Director of Education and Outreach, University Corporation for Atmospheric Research
Research Scientist, High Altitude Observatory, National Center for Atmospheric Research

rmjohnsn@ucar.edu

Roberta has a PhD in Geophysics and Space Physics from UCLA and has published over 30 papers in the area of upper mesosphere and lower thermosphere research as well as on educational programs. She is the PI on the award-winning *Windows to the Universe* website (sponsored in part by NASA and the NSF), which brings scientific background content and new research results to the public, students and educators in English and Spanish. She has extensive experience advising NASA, NSF, and professional societies and serves on numerous advisory boards for projects in education, outreach, and diversity. Dr. Johnson was responsible for development of the Education and Outreach component of the NASA OSS Sun-Earth Connection Roadmap in 2001-2002. She was formerly the Chair of the American Geophysical Union (AGU) Committee on Education and Human Resources (CEHR), focused on development of resources, programs, and services for students at all levels, educators, the public, as well as young scientists involved in establishing their career in the geosciences. As CEHR Chair, she initiated a Subcommittee to CEHR on Diversity, and served as a member of the subcommittee, tasked with developing and implementing a plan to increase the diversity of the geosciences. Prior to her service on CEHR, she was Chair of the Space Physics and Aeronomy Education Committee of the AGU. She was a member of the American Meteorological Societies Education Advisory Committee. She chaired the Earth Science Education Roadmapping activity and was a member of and education representative on the NASA Earth Science Enterprise ESSAAC committee. She is currently the executive director of the National Earth Science Teachers Association. As Director of the UCAR Education and Outreach Program, she oversees services and resources for the students, educators, and the public, including professional development programs for educators, web resources for students, educators, and the general public, event programming, exhibit development, and opportunities to increase the diversity of the geosciences.

Bringing MILAGRO Science to the Public, Students, and Educators through the Windows to the Universe Website – A Collaboration Between Scientists and Educators

R. M. Johnson, M. LaGrave, L. Gardiner, R. Russell, J. Bergman, D. Ward, S. Foster, J. Genyuk, N. Gordon - UCAR Office of Education and Outreach, PO Box 3000, Boulder, Colorado 80307 – 3000; E. A. Araujo-Pradere - CIRES-University of Colorado, NOAA-Space Weather Prediction Center, Boulder, CO;D. Salcedo - Universidad Autónoma del Estado de Morelos; J. Weinstein-Lloyd – SUNY; and B. Cardenas Gonzalez - Instituto Nacional de Ecología

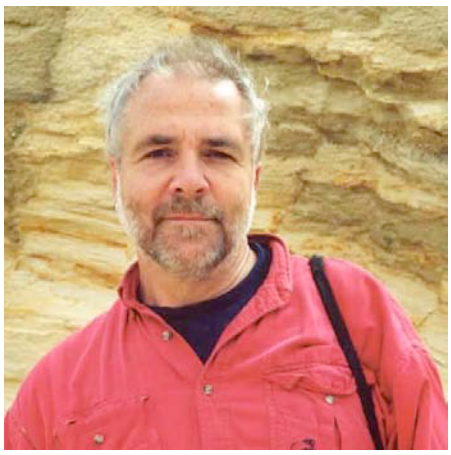
Email: rmjohnsn@ucar.edu

Windows to the Universe (http://www.windows.ucar.edu) is a popular and comprehensive Earth and space science education web site that uses an interdisciplinary approach to engage our global audience. The entire Windows to the Universe site (over 7,000 pages) is being translated into Spanish, with support from the US National Science Foundation. Large portions of the site have already been "published" to the web and have been in use since October 2003. Web site statistics indicate that use of the Spanish portion of the site has quickly ramped up to ~25% of total site traffic or ~450,000 visitors per month. The largest fraction of non-US users of the Spanish website come from Mexico, with growing use from countries from Central and South America and Spain. Over the past 12 months, over 4.2 million users from around the world accessed our Spanish language Earth and Space Science educational resources on the website, including over 960,000 from Mexico.

The website includes over 100 classroom activities, inter-actives, and demonstrations for teachers to use to bring the geosciences to life for their students. Many of these activities have been translated into Spanish, and are available at no cost to educators around the world. The presentation will include demonstrations of our activities, and participants will be provided resources to take back to their classrooms.

A dedicated education and outreach project was developed to support and complement the MILAGRO campaign (March 1 – 30, 2006), which took place in Mexico
City and adjoining communities. MILAGRO was an intensive observational mission to
study the emissions, and the chemical and physical transformations of gaseous and aerosol pollutants within and in the outflow of the world's second largest metropolitan
area, Mexico City. This Megacity Initiative: Local and Global Research Observations (MILAGRO) Campaign involved coordinated aircraft and ground-based measurements supported by extensive modeling and satellite observations.

The project brought the compelling and socially relevant science of MILAGRO to
both Spanish and English speaking audiences around the world through the website, allowing diverse students, educators, and the public to become better informed about critical atmospheric research issues, the process of scientific discovery, and related career opportunities. Reports from the field, from participating scientists, graduate students, and educators from Mexico and the United States, brought the science of the campaign to life for a global audience of learners, including those living in other megacity environments around the world.



Dick van der Wateren

EGU Press Officer
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Dr. F.M. (Dick) van der Wateren is specialist in science communication, earth scientist and teacher.
In 2002, I started my own company Landforms Science & Media, which develops strategies to communicate scientific topics. We focus on:
- designing educational projects — targeted at schools and other organisations;
- communicating with the press and other media — targeted at scientific organisations;
- producing documentaries — targeted at a wide audience.

Before starting my company Landforms Science & Media I have spent 25 years doing geological studies in the Netherlands, Germany, Denmark, Spitsbergen, Antarctica, Namibia and Botswana. My scientific interests are geology and geomorphology of deserts and glacial landscapes (e.g. push moraines, till plateaus), climate change, tectonics and microstructures in deformed sediments.
From 1977 to 1984, I worked as a geography teacher, while I am currently working as a physics teacher in Haarlem and will be involved in developing a new science curriculum for Dutch schools.
Over 25 years I have published more than 60 papers in scientific and popular journals and textbooks.

The Copernicus Journal for Young Scientists

Dick van der Wateren
EGU Press Officer
Landforms - Science & Media

An online scientific journal for all young people in Europe. Copernicus - Journal for Young Scientists is a forum where professional scientists present the results of their research in an exciting format to young people and challenge them to do serious research themselves.

A typical Copernicus article consists of a report about some interesting research topic, a short biography of the scientist concerned, and — most importantly — an experiment, urging the readers to discover things for themselves. Sometimes this package also includes a short film produced by young people who are coached by professional film makers. Next, the young scientists (our readers) can publish their findings in Copernicus, following our pre-set format.

The journal provides inspiration for projects and lessons in secondary schools, museums and science centres, or simply at home. It is an ideal vehicle for integrating several disciplines that are normally taught separately at school.

Copernicus encourages youngsters to critically examine scientific results and the way school textbooks present these.

Copernicus dares clever, demanding young people to reach just that bit higher than usual. It also offers plenty of fascinating items to young people who are not so very interested in science yet, so that they too may take the plunge.

At the GIFT Workshop 2007, I will present the latest developments with the journal. I hope to set up a European network of teachers/supporters who are interested in working with Copernicus - Journal for Young Scientists.

http://journal.copernicus.org/en/

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I've been a teacher for nearly 40 years : first a primary school teacher, then a Mathematics or Technology teacher in a junior secondary school and after that a Physics and Chemistry teacher in an upper secondary school. Now, I'm teaching Applied Physics to post-baccalaureat students (vocational courses in Electricity).

Apart from my teaching job, I've been a member of different research teams implemented by the ministry of Education since 1987 (pedagogical uses of satellites images, computer assisted experiments in Science, location by satellite…) and a member of teachers training teams (electronics, ICT and satellite data uses).

Since 1987, I've been organising workshops for interested students in my school on all the subjects linked with satellite data : local satellite images, oceanographic measurements using drifting buoys... and now a workshop on atmospheric studies. My students (from 15 to 22 years old) organise exhibitions, build slides presentations for national and international competitions and generally present their work every time they do have an opportunity.

Presentation of some of the projects implemented in a workshop « Space and Environment » with 15 to 22 years old students in an upper secondary school in Reims.

Nicole Herman
Lycée Rooselvelt, Reims, France

Examples of subjects

- Building a model of the Aral Sea and studying how altimetric satellites are monitoring lakes and oceans levels.
- Using energy sensors to explain how the sea surface temperature is measured from space
- Studying the water quality in our arable farming region and show how the GPS system can be used to prevent having too much nitrogen in rivers and groundwaters

Examples of activities

- Organising experiments, realising posters for exhibitions, creating computer slide presentations…
- Learning how to present facts and information to school youngsters, to general public, to specialists…
- Working in teams and participating in national and international scientific contests…

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My name is Jean-Raphaël DEUTSCH . After graduating from University in History, I worked in the centre of Paris, in a college and high school called “le Collège Sévigné” as a teacher in History, Geography and Citizenship to students 11-to-18 years old, but before beginning to teach, and in the middle of my career, I had the opportunity to work in a private company about urban planning and urban studies. Moreover, I trained primary school teachers about History and Geography, and since 2001, I train future teachers responsible of courses of History and geography in English (which is called “section européenne” in France and “bilingual classes” in other European countries).

I have always been interested in environmental problems, especially those related to big cities. I have participated to some conferences about these topics and the way to teach them.

Since 2000, my 15-16 years old students have been participating to a European competition organised by the” Foundation for Environmental Education”: They wrote articles in English about various topics dealing with the Parisian environment (pollution, energy, waste, climate change, etc..) for the website http://www.youngreporters.org/

I think that teachers must show the links between science, geography and citizenship to educate young people about their environment, so that later, this subject should be an important element of their choice as citizens

From 1910 to 2010 : a new Flood in Paris?

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In 1910, an important flood surprised the inhabitants of Paris. For weeks, they had to walk in the water, particularly in the central districts, near the river Seine There was no more electricity , the subway could not be used anymore and Life in the city became very different!

Great flood happen in Paris and its area every 100 years; after the 1910 flood a lot of works were done to prevent a new disaster. But are we sure that everything has been done and that everything will work?

Young reporters, students in the Collège Sévigné, Paris, have been gathering information about different aspects of this problem:

- How do the local authorities of the city prepare such an event?
- How are the inhabitants informed about the risk of flood?
- What could be the consequences for the inhabitants (transports, jobs, disease, water
- pollution etc)?
- How could the inhabitants be evacuated from the City?
- What could be the consequences for the electric and electronic systems in the City?
- What could be the consequences for the museums and the monuments?

In big cities, as everywhere else, prevention, information are important elements to save lives

Eduardo F.J. de Mulder

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Eduardo de Mulder was born in Amersfoort, the Netherlands, in April 1947. He is a geologist, specialized in urban and environmental geosciences. He is an emeritus Professor in Subsurface Management at the Technical University of Delft. Most of his professional career he spent in the Geological Survey of the Netherlands. Since the mid 1980s he became more involved in international organisations and has been actively involved in the creation of an international Working Group on Urban Geology, in the early 1990s. From 2000 – 2004 he was the President of the International Union of Geological Sciences (IUGS), the largest scientific union dealing with the Earth. In that capacity he launched the plan for an International Year of Planet Earth (IYPE) covering the period from early 2007 to the end of 2009. This initiative was adopted by the United Nations who proclaimed the International Year for 2008. Since 2004, he has been working towards the realization of this major event, nicknamed 'The Greatest Geo-Show on Earth'. Since November 2006, Eduardo de Mulder is the Executive Director of the IYPE. EGU is one of the International Partners of the IYPE.

He is the author and co-author of some 115 scientific papers and books dealing with the various facets of his professional career: palaeontology, stratigraphy, engineering geology, environmental geology, urban geology, geoscience information systems, subsurface management, and geoscience & society.

Towards underground cities?

Eduardo F.J. de Mulder

Executive Director of the International Year of Planet Earth
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The subsurface is and has always been essential to human survival and development. Such development peaked in Roman Times, during the Industrial Revolution and in the second part of the 20th century. Apart from transport (tunnels) and extraction (mines), the subsurface hosts a wide variety of human activities. These include storage of strategic materials, disposal of wastes or greenhouse gasses, provision of food and water, sustaining ecosystems and nature, habitat for life, production of energy, shelter, archive of past records of climatic change and biological evolution, medium to attenuate contamination, supporting constructions, et cetera. Increasing population and industrial pressure on ever more limited space at surface inevitably drives us toward more intensive use of the subsurface. Sustainable use and management of the subsurface requires forward thinking and planning, including multiple use of the underground. This paper discusses issues and trends leading to more intensive use of the subsurface with a special focus on urbanized areas. Finally, some views on the futures of cities will be presented including underground options.

Brittany Neptun

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Brittany Neptun is an Environmental Geoscience teacher on the Northfield campus of New Trier High School, located in a suburb of Chicago. Brittany is currently in her seventh year of teaching, and has taught students age 14 through 17 years. Prior to teaching, she worked for three years at a consulting firm to the energy industry.

Brittany strives daily to inspire students "to commit minds to inquiry, hearts to compassion, and lives to the service of humanity"® as put forth in New Trier's mission statement. She helps students investigate and understand their role as global citizens through teaching them about the various interactions on our dynamic planet. Although the content of her course is fascinating, her primary focus is to cultivate a passion for learning and bring creativity to the classroom.

Outside of the classroom, Brittany is a coach of the campus' competitive Science Olympiad team. Her role as coach is to prepare students for various Geoscience events as well as mentor these highly motivated students and nurture competent, skilled, scientific thinkers.

In her free time Brittany enjoys traveling and spending time with her husband and two preschool aged daughters.

Education and Professional Associations

B.S., Recreation Resource Management, College of Natural Resources, University of Minnesota, St. Paul, Minnesota, USA

M.A.T., Secondary Education, National Louis University, Wheeling, Illinois, USA

Member of the National Earth Science Teachers Association

Member of the National Association of Geoscience Teachers

The Eco-Village Challenge: A student investigation and application of environmental land use planning

Brittany Neptun
New Trier High School
Northfield, Illinois, USA

This presentation focuses on describing an activity that helps students develop and understand methods used to mitigate the various environmental impacts humans have on our world. The activity, "The Eco-Village Challenge", requires students to use their understanding of the earth's spheres and current global environmental issues to research, design, and construct a model environmentally-minded village. Students work in small land use planning teams to research and decide what type(s) of energy, transportation, waste disposal, and commercial and residential building designs will be used in their village so that there is a minimal impact on the earth. After the research component is completed, students design and construct a labeled, three-dimensional model of their "Eco-Village". Students finally draft a village charter to document why their village is being created and how it will encourage citizens to make environmentally friendly decisions. Through the development of an environmentally-minded model community and village charter, this project shows students that they can make sound environmental decisions and potentially influence local government on issues pertaining to the social, financial, and environmental betterment of real-world communities.

Sue Howarth
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After studying Zoology at Leeds University, I completed my PhD in Physiology at London University, UK and Memorial University, St. Johns, Newfoundland, Canada. I then returned to the UK to work for the Open University in Milton Keynes, Buckinghamshire and in Cambridge as a Post-doctoral Fellow. As well as my research into tapeworms, I was involved with the university's summer schools and this gave me the passion for teaching that I still have.

I took a specialist Science teacher-training course at London University and have been teaching Science at secondary schools ever since. I have worked at both state and independent schools, working for the longest time at The Royal High School in Bath, where I was Head of Biology. I am currently teaching at Tettenhall College, an independent school for ages 3 to 19, though I only teach students in the senior school, aged 11 years and up.

My Science teaching has always involved a certain amount of Chemistry and hence Earth Sciences, as in the UK these are mostly taught as part of Chemistry courses. I have always had an interest in Geology and our garage is full of stones, rocks, minerals and fossils that I have collected and really mean to sort one day!

My teaching interests include developing strategies to help underachievers and de-motivated students become involved and interested in learning, as well as trying out ways to extend the most gifted and able in Science. The use of ICT in teaching and learning and how teachers keep up to date are also amongst my current key interests.

In 2005, I was fortunate to be awarded 'Teacher of the Year' from the Institute of Biology, presented by Tony Blair. I have also had a Teacher Award from The Daily Telegraph, a national newspaper, for encouraging students to write scientific articles.

Alan Woollhead
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After studying Zoology at Leeds University, I completed a PhD in Ecological Energetics at Glasgow University. I then worked in Libya, teaching Biology, before returning to the UK to take a teacher training course at Bristol University and have been teaching at secondary schools ever since.

I am currently Head of Biology at Bromsgrove School, an independent (fee-paying) school for ages 13-19 years. I am always interested in new ways of teaching students and in finding new methods that encourage students to learn more effectively. My joint presentation on using sweets and biscuits to teach some ideas in geology is an example of creating interest amongst students…..and of course, we always have some left over for participants to take away!

Recently, I have attended workshops in the Sanger Centre in Cambridge and at the EMBO (European Molecular Biology Organisation) in Heidelberg where I enjoyed meeting other teachers and was able to bring back many ideas to update the teaching within my department. I also enjoy using ICT to enhance teaching and our bird nest box with camera inside has proved of great interest to students, staff and parents.

Geology is an interest that links into my Biology teaching in many ways. The new Salters-Nuffield Advanced Biology A level for 16-19 year olds that my department has just started teaching has a topic on climate change and the Science GCSE (General Certificate for Secondary Education for 14-16 year olds) has several topics linked to Earth Sciences including using fossils as evidence for evolution.

I am lucky to live near the Wren's Nest, Dudley which is a National Nature Reserve and of international importance both for the quality and quantity of its fossils and also for its value as an educational resource.

Sweet Science

Dr Sue Howarth
Tettenhall College, UK

Dr Alan Woollhead
Bromsgrove School, UK

Some practical ideas for teaching geology / earth science to 11-14 year old students using sweets and biscuits

- Most, if not all of these ideas, were probably someone else's, but they have been used for many years and adapted and the original sources forgotten, so we apologise if acknowledgements should have been made.

- All of the activities described have been tried and tested during Science lessons. Where eating the products has been a part of the outcome, then the lesson has been moved to a Food Technology room or outside, so that the **'no eating in laboratories'** rule was not broken.

- Each activity has had a full risk assessment carried out and details will be available on the handouts at the conference.

- Sources and suppliers information will be available on the handouts

1. Crunchie bars: demonstration of how the rate of cooling affects crystal size in igneous rocks

Time: 15-20 minutes

Igneous rocks that form from magma that cools rapidly have smaller crystals than rocks that cool slowly.
For example, lava that flows into the sea cools very quickly. The crystals in lava rock are so small that they are not obvious. Other rocks such as gabbro, an intrusive igneous rock, cool very slowly, maybe over thousands of years, allowing large crystals to form.

The effect of cooling rate can be seen simply by observing closely any sweets that have a honeycomb structure such as a Crunchie bar. Cutting a section and using a hand lens, allows students to see that bubbles formed near the edge (which cools first and therefore fastest) are smaller than bubbles near the centre (cools last and therefore slowest)

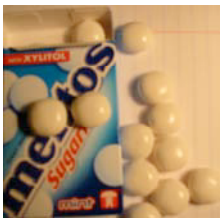
Students can draw a section and label the bubbles.

Extension work could include the good and bad points about this model.
As an alternative, a similar exercise can be carried out on a slice of bread (home made works best)

2. Mints and coca cola / pepsi: model volcano

Time: 5 minutes if set up already, longer if variations explored or students write up an explanation or the video clip is shown

This is a variation on the much used vinegar and bicarbonate of soda (sodium hydrogen carbonate) demonstration. Not only does it smell better, but it produces a more dramatic effect. Mentos mints and diet coke seem to work best.



The whole set up is best done within a large tray and it is wise to have a mop handy! Red food dye can be added to make the 'molten lava' more realistic.

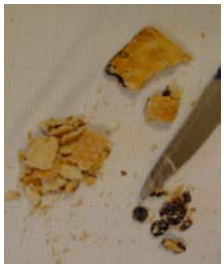
A conical flask with a bung through which a glass tube is inserted works well. Mud can be built up around the flask to simulate a mountain and to add to the effect, small plastic houses e.g. from a Monopoly board game can be embedded into the 'mountain'.

We hope to show a short video of how this demonstration can be extended with dramatic effects.

3. Garibaldi biscuits and chocolate chip biscuits: mining an ore

Time: 60 minutes (but can be shortened)

Mining and extraction of mineral ores can be simulated in this fun but educational practical. Students weigh a biscuit and then have to dig out the currants (Garibaldi biscuits) or chocolate chips (choc chip biscuits). They then weigh the total currants or choc chips (the wanted material) and work out the percentage they have managed to extract (good maths practice!) If all the class works on the same kind of biscuit, the mean percentages can be found and (assuming no one ate any during the mining operation) compared to the given percentage on the packet.

Extension work could include carrying out repeats; comparing different brands; using different 'tools'; putting results onto an Excel spreadsheet and calculating standard deviations

4. Toffee: making a fossil

Time: about 30 minutes plus 'setting' time (at least 20 minutes)

This activity allows students to make their own amber 'fossils'. It is fairly simple, but students enjoy doing it and it sparks their curiosity so that they are keen to learn more. Many will have seen the film 'Jurassic Park' and can be reminded that the dinosaurs in the story were cloned using DNA from insects fossilised in amber.

Very hot mixtures are involved so this may not be suitable for all students to carry out. A toffee mixture is made using karo syrup, sugar and water and heated until 'cracking point'. Small plastic bugs (Christmas crackers are a useful source or joke shops) are placed in muffin tins and the hot liquid toffee poured over. After setting, the 'fossils' can be tipped out and the specimen preserved inside amber observed.

Real insects / bugs can be used instead of plastic ones (the drier the better – dead bees and wasps work well, grasshoppers less well)

Termites in amber

http://www.engineering.usu.edu/jrestate/workshops/amber/amber.php

These amber 'fossils' are edible apart from the plastic bugs, but if they are made in a science laboratory, it is not recommended that students eat them or any real insects used. The 'fossils' can be enclosed in a plastic bag and stapled to a wall to make an interesting display.