

Commission 1.1 Soil Morphology & Micromorphology Newsletter

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Letter from the Chair

Dear Members,

Welcome to our third bi-annual Newsletter! Our most exciting news is that the 13th International Conference on Soil Micromorphology in Chengdu China, Sept. 11-16th is well underway. Registration is **DUE JUNE 1st**! and Abstracts are **DUE MAY 30th**! Details are listed below. I look forward to seeing you there!

Also note: The IUSS will be offering three \$500 awards (a total of \$1500) to people from developing countries to attend the 13th International Conference on Soil Micromorphology, Chengdu China, Sept. 11-16, 2008. Those who are interested in getting this funding should contact Ahmet Mermut at the following email address: mermut@skyway.usask.ca

In addition, the IUSS will offer an award program for best posters at that meeting (\$150 for first, \$100 for second and \$75 for the third place winners).

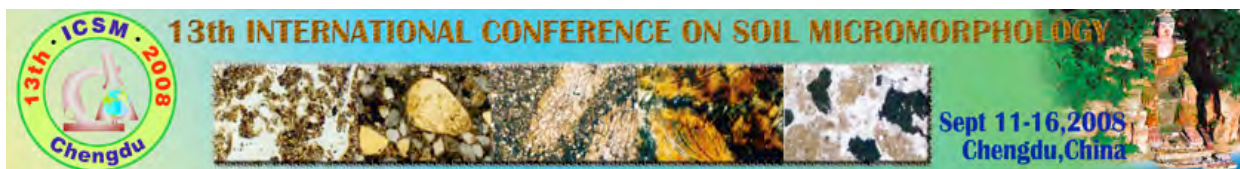
Other Announcements:

- Decisions on which symposia will be offered for the 19th World Congress in Brisbane, Australia 2010 will occur during the mid-congress meeting on June 30-July 4, 2008. Our Commission can support only 2. We currently have 3 proposed symposia pending (details below). If you have any comments, suggestions, please get those to me ASAP so that they can be considered.
- The 3rd Intensive Training Course on Soil Micromorphology will take place in Barcelona Spain, June 8-19, 2009 by Drs. Rosa Poch, Àngels Canals, and Georges Stoops (details below).
- Dr. Richard Heck <http://www.uoguelph.ca/~rheck/> reports that the Meeting of X-ray Computed Tomography of Soil that was held last August at the University of Guelph, Ontario Canada was very successful and they are currently working on a special issue of Geoderma that has a planned publication late in 2008. Dr. Heck also reports that the Canadian Soil Thin Section Collection website has been updated and has a new URL: <http://gis.lrs.uoguelph.ca/cstsc/> Currently, it is focused on sections prepared for the 1978 ICSS in Edmonton. If funding comes through, they will be adding another major component related to northern soils from around Hudson's and James Bays.
- There is a proposal to the IUSS Council by Prof. Yaalon, for a Working Group on Global Soil Change. Details below.

- Micromorphology of Selected Profiles by Dr. E.A. FitzPatrick Version 2 Beta is now available. This CD has numerous AMAZING photos of soil profiles, thin sections, and SEM images from soils around the world. To get your own, contact Dr. FitzPatrick: e.a.fitzpatrick@btinternet.com or write to Interactive Soil Science, 76 Burns Road, Aberdeen, AB15 4NS UK
- We have very sad news at the passing of Peter Bullock. In his honor, Georges Stoops wrote a letter (below), which can also be found on our web page: <http://www.agry.purdue.edu/pedology/iuss/>. Listed below is another obituary on his life. We will honor both Peter and Geoff Humphreys in special symposia at the 13th International Conference on Soil Micromorphology in Chengdu China.
- New information on our website: <http://www.agry.purdue.edu/pedology/iuss/> includes a viewpoint article by Dan Yaalon in the December issue of BioScience on “Human-induced Ecosystem and Landscape Processes always involve Soil Change.”
- Thanks to Dr. Phil Owens & Brad Lee at Purdue University for keeping our IUSS Commission 1.1 Webpage up to date! THANK YOU!

Details on these topics are below. Please send any new information to me, Brenda J. Buck (buckb@unlv.nevada.edu) or Vice Chair, Rosa Poch (rosa.poch@macs.udl.es).

Sincerely
Brenda J. Buck
Chair, Commission 1.1
Dept. Geoscience, University of Nevada Las Vegas
4505 Maryland Parkway
Las Vegas NV 89154
<http://www.agry.purdue.edu/pedology/iuss/>



Sessions and Corresponding Convenors

1. Interpreting soil quality and agro-environment sustainability

Convenors: Q. Cai, S. Nortcliff, L. Bissonais, X. He

Corresponding: Q. Cai, caiqq@igsrr.ac.cn

2. Interactions between organisms, fabrics & minerals

Convenors: B. Buck, I. Young, Y. Zhang, P. Owens

Corresponding: P. Owens, prowens@purdue.edu

3. Micromorphic investigations on global scale processes

Convenors: C. Monger, S. A. Shoba, C. Ping

Corresponding: C. Monger, cmonger@nmsu.edu

4. Micromorphology of soils in extreme environments

Convenors: L. Sullivan, B. Buck

Corresponding: B. Buck, buckb@unlv.nevada.edu

5. Urban and technogenic soils

Convenors: A. Lehmann; H. Eswaran; W. Burghard.

Corresponding: W. Burghard, wolfgang.burghardt@uni-essen.de

6. Micromorphology for paleopedology and loess, **Honoring G. Humphreys**

Convenors: D. Sauer, N. Fedoroff, A. Bronger

Corresponding: D. Sauer, d-sauer@uni-hohenheim.de

7. Micromorphology for archeology

Convenors: S. Kapur, A. Tsatskin, M. Courty, P. Goldberg

Corresponding: M. Courty, courty@tautavel.univ-perp.fr

8. Soil Genesis and classification **Honoring Peter Bullock**

Convenors: M. Wilson; G. Stoops, A. I. Faz, S. Mahmoodi

Corresponding: A. Faz, angel.fazcano@upct.es

9. Ultra-micro technologies and image analysis

Convenors: R. J. Heck, A. R. Mermut, F. Terribile

Corresponding: A. R. Mermut, mermut@skyway.usask.ca

10. Micromorphology in other sciences

Convenors: R. M. Poch, R. Fitzpatrick, R. Gilkes

Corresponding: R. M. Poch, rosa.poch@macs.udl.cat

11.Paddy soils

Conveners: G.Zhang, Ringrose-Voase, Siti Zauyah, Y.He
Corresponding: G.Zhang Ganlin, glzhang@issas.ac.cn

12.Mountain soils

Conveners: Cui Peng Zhu Bo, RM Poch
Corresponding: Zhu Bo, bzhu@imde.ac.cn

Tours/Fieldtrips

Pre-conference tour

T1: Lasa –Linzhi(Mountain soil)- Chengdu

(Cost: \$1200)

Sept. 6 Chengdu/Beijing flight to Lhasa
Sept. 7 Lhasa sightseeing
Sept. 8 Namtso Lake
Sept. 9 Linzhi
Sept.10 Linzhi Cypress Forest
Sept.11 Linzhi airport dropping off (to Chengdu)

Mid-conference tour

T2: Sanxindui (paddy soil) + Longqian Hill (purple soil)

(Cost: free)

Post-conference tour

T3: Chengdu-Jiuzhaigou (Mountain soil)-Chengdu

(Cost: \$550)

Sept. 16 Chengdu-Jiuzhaigou
Sept. 17 Jiuzhaigou
Sept. 18 Jiuzhaigou-huanglong-Maoxian
Sept. 19 Maoxian-Dujiangyan-Chengdu

T4: Chengdu-Chongqing-Zhongxian(Purple soil)-Yichang

(Cost: \$800)

Sept. 16 Chengdu-Chongqing (bus)
Sept. 17 Zhongxian (bus)
Sept. 18 Zhongxian-Yichang (overnight ship)
Sept. 19 Yichang airport dropping off

T5: Xian(Terra-cotta Warriors; loess)-Beijing(Great Wall)

(Cost: \$600)

Sept. 16 Chengdu-Xi'an (flight)
Sept. 17 Xi'an (overnight train)
Sept. 18 Beijing (Great Wall)
Sept. 19 Beijing airport dropping off

Please visit the conference website (<http://icsm.imde.ac.cn>) for detailed information.

IMPORTANT DATES

Jul 1, 2007	First Announcement
Dec 1, 2007	Second Announcement
May 30, 2008	Deadline for Abstract Submission
June 1, 2008	Deadline for Registration
Aug 15, 2008	Third Announcement
Sep 11-16, 2008	Conference



Proposals for Symposia for 19th World Congress of Soil Science, Brisbane, 2010

The following symposia are proposed from Commission 1.1. During the Mid-Congress meeting June 30-July 4, 2008, IUSS officers will discuss and vote to decide the final program. Our Commission can have only 2 symposia, and the decision as to which proposals are accepted depend to some degree on the topics submitted by other Divisions and Commissions. If you have any suggestions for the following proposals or new proposals to put forward, please contact me (buckb@unlv.nevada.edu) ASAP so that they may be considered during the mid-congress planning meeting. Thank you!

Soil Morphology and Micromorphology Commission 1.1

1.1.1 Expected Changes in Soil Morphology in Response to Global Climate Change.

Soils are expected to change under a warmer Earth but the types of modification and the rate of change are difficult to predict since it is not only temperature but also the amount and distribution of rainfall. This symposium will explore what soil parameters (i.e. organic matter content, salinity, erosion, mineral alteration, crusting) are likely to change at local and regional scales. Soil morphology and micromorphology can be used to measure these changes. By studying a suite of soil conditions from natural, little disturbed sites to sites of recent recovery we are able to glean a picture of what is likely to happen. This symposium will provide a basis for updating earlier viewpoints as expressed in books such as Scharpenseel et al (1990) and Bouwman (1990), which will be 20 years old at the time of the congress.

1.1.2 Soils in Extreme Environments: Earth and Beyond

Extreme environments on Earth drive soil processes to their limits. This symposium will present the current state of research on extreme processes in soils. Whether hyper-arid to hyper-humid; acid to alkaline, cryic to tropical, on active volcanoes, inert materials or hypertoxic environments: what soil morphologic characteristics are produced? What are the extreme limits on life? And can they be used as analogs for extraterrestrial processes? We will explore these and other aspects of soils in extreme environments.

1.1.3 Soil Morphology and Micromorphology to Identify, Prevent, and Manage Environmental Hazards.

Many environmental and geologic hazards (landslides, earthquakes, floods, surface heave/collapse, pollution/contamination of water resources) can be identified and mitigated through the use of soil morphology and/or micromorphology. This symposium will explore the soil morphologic indicators that can be used to identify soil processes that either cause or exacerbate environmental hazards.

Come and enjoy the 3rd edition of the
Intensive Training Course on Soil Micromorphology !



The 3rd Intensive Training Course on Soil Micromorphology will take place in Barcelona (Catalonia, NE Spain), from the 8th to the 19th June 2009.

It is organized by the Universities of Lleida, Barcelona and Ghent, and will cover aspects of making and describing thin sections, characteristics of specific soil materials (arid, volcanic, temperate, tropical, glacial and periglacial), applications in agriculture, archaeology, geomorphology, soil genesis, and special techniques.

The course is directed to people with some background on earth sciences, who want to acquire expertise and to apply micromorphology in their studies. An optional weekend excursion is also offered, which will give the opportunity to enjoy several soils of Catalonia.

For more information contact rosa.poch@macs.udl.cat

1st announcement, May 2008

Intensive Training Course on Soil Micromorphology (3rd Edition)

Barcelona, 8-19 June 2009

Universitat de Lleida

Universitat de Barcelona

Universiteit Gent

Venue:

Dpt. Cristal·lografia, Mineralogia i Dipòsits Minerals, Facultat de Geologia

Martí i Franquès s/n , 08028 Barcelona, Catalonia (Spain)

Fax : +34934021340; Phone: + 34934021345

<http://www.ub.edu/geologia/english/facultat/map.htm>

Organizing committee

Prof. Dr. Rosa M. Poch UdL (co-director) rosa.poch@macs.udl.cat

Prof. Dr. Àngels Canals UB (co-director) angelscanals@ub.edu

Prof. Dr. Georges Stoops UG

Duration

6 credits (60 lecture-hours)

Themes

- Principles of mineralogy and petrography, optical mineralogy
- Submicroscopical and special techniques
- Making thin sections
- Guidelines for the description of thin sections of soils and regoliths
- Micromorphology of soil materials and identification of soil formation processes: carbonate-, gypsum- , and salt affected soils, volcanic soils, clay accumulation, hydromorphic soils, tropical and highly weathered soils, glacial and periglacial processes.
- Micromorphometry and image processing.
- Applications of micromorphology:
 - Soil genesis and classification
 - Agronomy: sealing and crusting, structure and porosity
 - Archaeology
 - Geomorphology and sedimentology
 - Mineral weathering
- Optional weekend excursion: Mediterranean soilscapes, soil genesis, sampling techniques.

IN MEMORIAM PROF. DR. PETER BULLOCK



Prof. Dr. Peter Bullock was born on 06/07/1937 and passed away on 02/04/2008.

He was a highly distinguished and influential soil scientist, with a large experience in the field of soil mapping, classification and land evaluation, soil mineralogy, micromorphology and genesis, and in the last part of his career involved in global environmental changes.

After obtaining a BSc in Geography at the Birmingham University, he joined in 1958 the Soil Survey of England and Wales (SSEW) as a surveyor. In 1963 he enrolled at the Leeds University where he obtained a MSc. in Agricultural Chemistry. With a prestigious Fulbright scholarship he afterwards studied at the Cornell University (USA) and obtained a Doctorate in Agronomy with a thesis dealing with clay translocation in soils.

In 1967 he became Head of the Mineralogical Section in the SSEW based at Rothamsted Experimental Station in Harpenden. In this function he created a micromorphology laboratory in support of soil mapping and classification. After acting as Head of Research in SSEW in 1984, Peter Bullock became Director of the Survey in 1986, at the moment that it was transferred to the Silsoe campus of Cranfield Institute of Technology. He became Professor of Land Resource Management at Cranfield, and later Emeritus Professor in 1997 after he retired.

Peter Bullock was President (1995-1996) of the British Society of Soil Science, chaired the Natural Environmental Research Council Review Committee, became in 1988 Chairman of the Heads of Soil Surveys Committee of the European Union, which led in 1996 to the chairmanship of the Advisory Committee of the European Soil Bureau. In 1991 he became member of the UK Climate Impacts Review Group. In addition he was adviser to several governmental commissions.

Peter Bullock played a very important role in developing and promoting soil micromorphology. On a national level this was done by demonstrating in many meetings the importance of micromorphology for studies on genesis and in classification. In 1968 he organised a first, very successful symposium on this topic in the UK. On international level

one has to emphasise the fact that he trained several soil scientists of different countries in these techniques.

In 1972 he was invited as member of the “International Working Group on Soil Micromorphology” of the ISSS, founded in 1969 and that later gave rise to the foundation of “Subcommission B” “Soil Micromorphology” of the ISSS, of which he became Chairman in 1978. Under his chairmanship the Working Group published in 1985 the “Handbook for Soil Thin Section Description” (P. Bullock, N. Fedoroff, A. Jongerius, G. Stoops, T. Tursina and U. Babel). In 1981 he organised the 7th International Working Meeting on Soil Micromorphology in London and published, together with his co-worker C. Murphy two outstanding proceeding volumes. Together with co-workers of the SSEW and trainees he published a number of papers on soil micromorphology, both on methods and on interpretation, that still preserve, after many years, their scientific value and keep on being cited. Most of his publications deal with temperate soils, especially those of the UK.

After his retirement Peter Bullock remained active at Cranfield. He was instrumental in the launch of the World Soil Survey Archive and Collection, (WOSSAC) and the “Soil Net”, educational internet portal aimed at school teachers and students.

Peter Bullock’s passing away is without doubt a serious loss for the micromorphological community.

Gent, April 20th, 2008

Em. Prof. Dr. G. Stoops

Professor Peter Bullock 1937-2008

A leading soil scientist who tirelessly promoted the importance of soil Professor Peter Bullock was a hugely distinguished, influential and inspirational soil scientist with a prestigious professional career spanning some 50 years. His professional experience included: soil mapping and land evaluation, soil mineralogy, soil genesis, land degradation and global environmental change. He worked in the UK and the USA as well as visiting some 20 other countries on a professional basis.

Peter Bullock rose to become a leading figure in UK soil science and one who was universally liked and admired by all who knew him. He took over directorship of the Soil Survey of England and Wales at Rothamsted Experimental Station in 1986, at a time when the organization was threatened with closure, and won its reprieve. This led to its successful transfer to the then Cranfield Institute of Technology two years later. His courageous and charismatic leadership was a major factor in ensuring the continued existence of a research institute focused on English and Welsh soil resources. The National Soil Resources Institute at Cranfield University today is the direct descendant of the Soil Survey of England & Wales.

Born in 1937, Peter Bullock developed his early interest in the natural environment studying Geography at Birmingham University. He joined the fledgling Soil Survey of England and Wales (SSEW) in 1958 to work as a soil surveyor during which time he was based in Yorkshire. In 1963, he returned to university to study for a Masters in Agricultural Chemistry at Leeds University. A year later he was awarded a prestigious Fulbright Scholarship which took him to Cornell University to read for his Doctorate in Agronomy, focused on clay translocation in soils. He worked briefly for the United States Department of Agriculture Soil Conservation Service as a field soil surveyor in New York State before returning to the UK in 1967 to take up the position of Head of the Mineralogy Section in SSEW based at Rothamsted Experimental Station in Harpenden. Rothamsted allowed him the opportunity to indulge both his scientific and sporting interests and he was a key and enthusiastic member of the Cricket team for many years.

In his new post, Bullock developed facilities for study of the microscopic structure and morphology of UK soils in support of soil mapping and classification and became a leading world expert in the field of soil micromorphology. He went on to produce, among other things, the first major atlas of soil thin-sections as well as a systematic terminology for their description. He led work on the development of soil thin-section technologies and initiated much of the early work on computerised image analysis of soil micromorphology. Acknowledgement of his widespread expertise in this area saw him become first Secretary-General of the International Commission on Soil Micromorphology and then its President in 1978.

In 1981, Bullock joined the Council of the British Society of Soil Science, cementing his strong association with this society which was to continue throughout his career. He later served as its President for the years 1995 - 96. Bullock had taken on the wider remit of Head of Research in SSEW when, in 1984, the decision was taken to withdraw funding from the country's main programme of strategic soil mapping. Faced with the imminent closure of

SSEW, Bullock was put in charge of a campaign to save the organisation. His single-minded determination and charismatic leadership led to a tapered reduction in funding and a lifeline transfer to the Silsoe campus of Cranfield Institute of Technology, then home to Silsoe College. He became Director of SSEW in 1986 and then of the Soil Survey and Land Research Centre, following the move to Cranfield in 1987, also then being made Professor of Land Resource Management.

Bullock's reputation as a leading and influential soil scientist grew through this period. He chaired the important Natural Environmental Research Council (NERC) Review Committee. In 1988, he became the Chairman of the Heads of Soils Surveys Committee of the European Union a role in which he worked to align the activities of the soil survey organisations across Europe. This led into his chairmanship of the Advisory Committee of the European Soil Bureau in 1996. In 1991, he became a member of the UK Climate Change Impacts Review Group, recognising the role that soil systems have in the wider debate on climate change that was then only just coming to public attention.

Bullock's growing influence on governmental and international scientific bodies continued in 1994 when he became a Special Adviser to the Royal Commission on Environmental Pollution (RCEP) for their seminal inquiry into the sustainable use of soil. This was followed by his invitation to join the prestigious Intergovernmental Panel on Climate Change (IPCC) as Coordinator of Impacts on Soils and Land Use. He served as a member of the Governing Body of the Biotechnology and Biological Sciences Research Council's (BBSRC) Institute of Grassland and Environmental Research and he subsequently joined the BBSRC Senior Appointments Review Committee.

Upon his retirement in 1997 after eleven years as Director of the Soil Survey and Land Research Centre, Bullock was made Emeritus Professor of Land Resource Management in Cranfield University. He continued his association with IUSS becoming a member of their Core Committee of the Working Group on Land Degradation and Desertification. In 2005 he was a joint author of a seminal European Commission Publication on the Soil Resources of Europe.

Despite retirement, Bullock retained an active interest in the work of the National Soil Resources Institute at Cranfield. He focused his energy on a number of projects. He was instrumental in the launch of the World Soil Survey Archive and Collection (WOSSAC) – a unique, global repository of soil survey materials collated from over 250 territories worldwide. Peter's final major contribution was through his work in the development of the widely acknowledged 'Soil-Net' educational Internet portal, a resource aimed at school teachers and their students. His texts have been consulted online by users in hundreds of schools worldwide.

Privately, Peter Bullock was a keen cricketer, member of the MCC and lifetime supporter of Luton Town Football club.

Peter Bullock, born 06/07/1937, died on 02/04/2008, and is survived by his wife and daughter.

Proposal to IUSS Council for Working Group on *Global Soil Change*

A working group that explores pedological implications of environmental change caused by global warming and human activities on soils and landscapes

Background: Pedological Implications of Environmental Change

On May 27 2007, Prof. Yaalon circulated a letter to a group of soil scientists around the world calling attention to the need for establishing a new **Working Group** (WG) within IUSS and possibly IASUS, WOCAT, EGU/SSS, and SCOPE. This was published in 27 July 2007 in the IUSS website under IUSS Alert 27. The proposed Working Group would not only monitor and model the soils and accompanying environmental change but especially to devise best ways of the soil system adaptation to these on-going human effects, and cooperate with and advise various international and regional organizations on the central role played by soil in global environmental change. So far more than 40 people in more than 20 countries have responded to this call. This number will certainly grow when this working group is publicized.

Why a New Working Group

The recent and detailed reports of the International Panel on Climatic Change (IPCC), Working Groups I, II, and III on Global Warming have emphasized that global warming and climatic variations, exacerbated by combustion of fossil fuel, will affect and harm the poorer countries in Africa, Asia, and the Americas. The reports called for measures to reduce or control these changes. Numerous international, regional and local organizations are now working on the implications of these reports and proposing actions and adaptations to climatic change. Soil scientists and pedologists must contribute their expertise to these discussions. Paleopedologists and soil and land-use specialists are experienced in understanding effects of such human and nature-driven changes and the need to contribute to these discussions.

Climatic fluctuations in the past have had dramatic impacts on human populations and civilizations (Weiss et al. 1993). It is so far unknown how climate will develop under global warming, but anomalous events could have dramatic impacts on life on our planet.

Working Group Objectives

- 1) Monitor and model the interactions of soils and environmental change and evaluate how to adapt soil systems and management to these on-going changes,
- 2) Cooperate with and advise international and regional organizations on the central role played by soil in global environmental change.

A Working Group (WG) is, therefore, proposed to explore and articulate how soils and land use play a major role in the on-going compositional changes in the Earth's atmosphere. The spread of agriculture in historical times initiated human alteration of the atmosphere, via the gradual destruction of preserved soil organic matter of the arable soils and of natural vegetation by forest clearing, fires, and land conversion (Lal et. al., 1999). Soil and land-use

changes mainly alter cycles of atmospheric carbon dioxide together with methane, nitrogen gasses, and particulates, in some cases long before the industrial age, when humans began consuming huge amounts of fossil energy. During the 20th century, air pollution from industrial and transportation sources have greatly accelerated human alteration of the atmosphere (*US Environmental Protection Agency; <http://www.epa.gov/climatechange/science/stateofknowledge.html>*). The large historical picture tells us about climate changes in the past and about the interactive role played by soils and land uses along with changing climates. Since complete global control of climate is unattainable, adaptation to prevailing and predicted conditions is strongly desirable.

Recent reports from IPCC emphasize how risks and effects of climate change will be distributed unevenly among nations and regions. Coastal and tropical nations in particular face specific challenges, especially those with developing economies. Many of these nations have enormous human populations which reside or manage wet soils and therefore face problems and risks with rising sea levels. Other nations have largely agricultural economies whose productivities are highly susceptible to climate and weather change. **The close interactions of global climate and global soil change are highly significant to the future role of IUSS and its relations not only with a wide array of other disciplines, from natural to social sciences, but with humanity itself.**

The proposed Working Group can explore how in the larger geological time scale, current warming may play out within the Earth's long-standing glacial cycle. A historically significant discussion among Quaternary geologists has focused on when the next, i.e., how soon, a new glacial cycle will begin. Humans rather than natural occurrences are risking problematic warming and extreme regional events, perhaps postponing the coming cooling era. Nevertheless, considerations and planning of projects on adaptation to climate change will benefit greatly from scientists who can articulate a broad, historic picture of the interaction of climate and soil.

Recent Developments

An International Conference entitled '*GLOBAL SOIL CHANGE Time-Scales and Rates of Pedogenic Processes*' took place in Mexico City on March 10-18, 2005. It was well attended by the international and Mexican participants of about 60 scientists from 13 countries. The Conference focused attention on time scales and rates of both natural and anthropogenically induced pedogenic processes in relation to the global soil change. The participants visited the area of Texcoco ex-lake, from the slopes of the Sierra Nevada to study soil topo-chrono-climo-sequences on volcanic and lacustrine sediments, bearing effects of human impact of different age and duration (prehispanic, colonial, and contemporary).

In December 2007, Prof. Dan Richter convened the First Workshop on Global Soil Change at Duke University with a primary objective of promoting and networking the world's long-term soil-ecosystem experiments as special laboratories that are particularly important in understanding global soil change. The workshop was attended by scientists from Africa, Australia, Europe, Asia, and the Americas, and was motivated by the central role played by

soil in meeting the challenges of increasing food production, and improving land management of carbon, nutrients, wastes, toxics, and water, all in the coming decades.

The Global Soil Change Workshop concluded that researchers and students should make the most of on-going long-term soil experiments, but that long-range planning needs to help network and support on-going and new long-term experiments that will help quantify human and climatic forcings of the Earth's soil. Workshop organizers have funding support from USA's National Science Foundation, the United States Department of Agriculture, and Duke University for five yearly meetings, and operate an advanced-format website to communicate with researchers throughout the world (<http://ltse.env.duke.edu>). The proposed IUSS working group can work closely with these long-term experimentalists who seek international collaborators to advance the science of global soil change.

References

Lal, R., Follet, R. F., Kimble, J.M., and Cole, V. R. 1999. Managing U.S. cropland to sequester carbon in soil. *J. Soil Water Cons.* 54: 374-381.

US Environmental Protection Agency.

<http://www.epa.gov/climatechange/science/stateofknowledge.html>

Weiss, H., M.-A. Courty, W. Waterstroö, F. Guichard, L. Senior, R. Meadow, A. Curnow. 1993. The genesis and collapse of This Millenium North Mesopotamian Civilization. *Science* 261: 995-1004.