

黄土通讯

V. Ložek

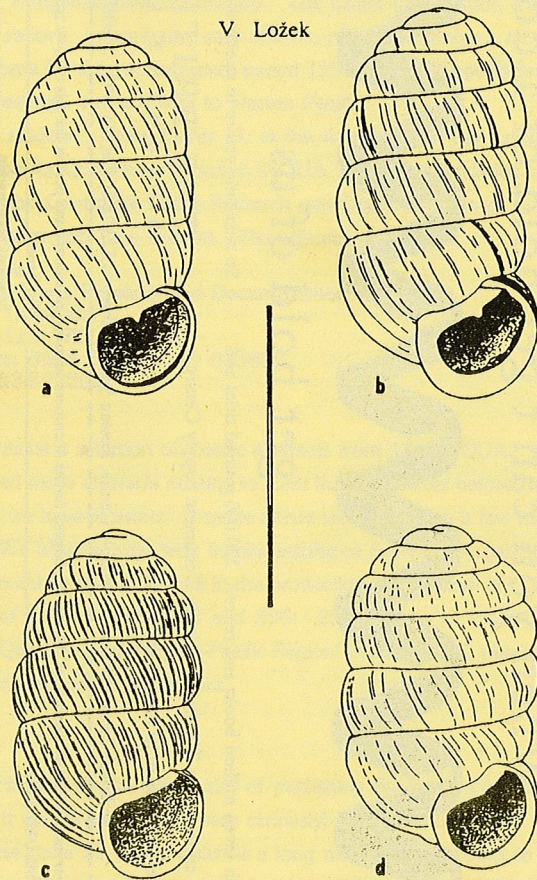
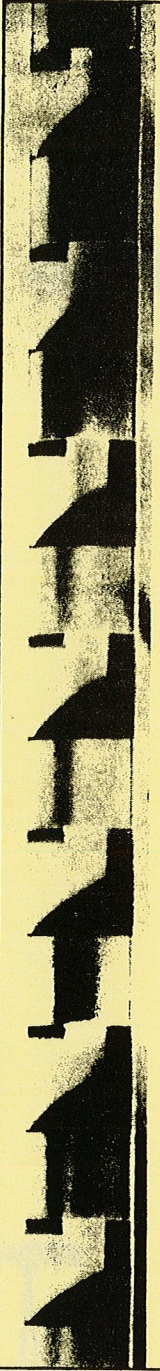


FIG. 1. Loess species of *Pupilla*: (a) *P. muscorum* (L.), typical, (b) large loess race of *P. muscorum*, (c) *Pupilla loessica* (Lžk), (d) *P. alpicola densegyrata* (Lžk).





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Here is LL26; read it carefully, it contains much important information, particularly in the first few pages. This is the post-INQUA issue, the report on the 13th INQUA Congress, held in Beijing in August 1991. It was a very successful congress, well organised and well run, definitely a triumph for the planners and organisers. It was undoubtedly the most 'loessic' congress ever, loess dominated the whole proceeding - which, given the location of the congress, is hardly surprising. We need to cover in this issue of LL the discussions held, and the decisions made, which affect the worldwide loess community. The Loess Commission met several times - and there is a lot to report: in particular new officers, new full members, new working groups. A research programme for the inter-congress period 1991-1995, prospects for publications, and for inter-congress meetings, and a tribute to Marton Pecs.

For new readers: Loess Letter LL is the newsletter of the Loess Commission of the International Union for Quaternary Research INQUA. It is published twice a year (roughly in April and October) by the Centre for Loess Research and Documentation at Leicester University, and edited by Ian Smalley and Tom Dijkstra. The editorial address is:

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LL26 contains a selection of loessic abstracts from 13th INQUA. The book of abstracts probably contained more abstracts relating to loess than have ever before been gathered together in one place - so we have to select. If space allows we will publish a few more abstracts in LL27 early in 1992. We acknowledge with thanks assistance from the Royal Society and the United Nations Development Project (in China) in the production of this issue of LL. LL is the newsletter of the UK part of IGCP Projects 252 and 296: 252 finishes in 1992 (see news item in this issue), 296 'The Quaternary of the Asia-Pacific Region' continues: LL reproduces relevant INQUA abstracts as a contribution to this project.

LL25. Halfway to the stated aim of publishing 50 Loess Letters. When LL was first published in NZ it was proposed (not very seriously) that we should have a target of 50 issues. This will, of course, take 25 years, which is a long time for any project to survive. But, after a few ups and downs 25 issues have appeared, and with LL26 we cross the mid-point and launch into the second half of the LL project. Think of LL26 as the first issue in the second part of the LL story.

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The Treasurer is Ed. de Mulder (The Netherlands), the vice-presidents are: Steve Porter (USA), Horst Hagedorn (Germany), Andre Velichko (USSR) and Jim Bowler (Australia). The next major INQUA Congress will be in Berlin in 1995.

Full Members of the Loess Commission for 1991 - 1995:

D.P. Agrawal (India); M. Cremaschi (Italy); D.D. Rousseau (France); H. Maruszczak (Poland); H.J. Mucher (Netherlands); A. Palmer (New Zealand); J. Sajgalik (Czechoslovakia); M.H. Iriondo (Argentina); M. Pecsí (Hungary), plus members for China and USSR.

Working Groups 1991 - 1995:

If you are interested in the topics covered by any of the Working Groups get in touch with the chairman or make contact via the Commission secretariat.

1. Loess chronology. G. Kukla, and Chinese co-chairman.
2. Formational processes related to loess. N. Fedorov and Wu Zi-rong.
3. Palaeo-environmental reconstruction of loess. M. Pecsí and A.A. Velichko.
4. Loess during the Holocene. M. Cremaschi. If all goes according to plan this WG will cooperate with the Holocene Commission.
5. Geo-archaeology of loess. P. Hasaerts. This WG will cooperate with the Early Man Commission.

6. Geotechnical properties and land-use. V. Osipov.
7. North America. L. Follmer and A. Busacca.
8. China. Han Jianmo.
9. Central Asia. A. Dodonov.
10. Loess in the Southern Hemisphere. D. Eden and A. Zarate. This group will be particularly involved with the Tephra and Palaeopedology Commissions in the 1994 meeting in New Zealand.
11. Palaeoecology. V. Lozek.
12. Europe. H. Maruszczak.

For the next inter-congress period (at least) the Documentation WG has been absorbed into the secretariat, so LL will be published, as before, from Leicester.

Cooperation with other INQUA Commissions

A major effort is to be made during the next inter-congress period to encourage cooperation between the various INQUA Commissions. The Loess Commission proposes to undertake cooperative endeavours with the Tephra, Palaeopedology, Holocene and Early Man Commissions. A major joint meeting is being planned for 1994; this will be the 'Loess, Tephra and Palaeopedology Conference' to be held in New Zealand, largely to prepare a joint submission to the 14th Congress in Berlin in 1995.

PAGES: For the first time INQUA has what might be called an overall theme; the problems of climatic change are providing a focus for Quaternary interest, and an arena for Loess Commission activity. PAGES stands for Plast Global Changes; it is one of five core projects that have been established by the ICSU International Geosphere-Biosphere Programme (IGBP). Two 'streams' have been identified which contain certain relevant research tasks.

Stream 1 will concentrate on the last 2000 years of Earth history; a period chosen as that of man's greatest impacts on the planet and the era of significant overlap between written records and the environmental information stored in natural archives. The objective of stream 1 of the PAGES project is to reconstruct the detailed history of climatic and environmental change for the entire globe for the period since 2000 BP with temporal resolution that is at least decadal, and ideally annual or seasonal.

Stream 2 will focus on glacial-interglacial cycles of the late Quaternary, concentrating on understanding the dynamics and causes of glacial-interglacial variations. The objective of stream 2 is to reconstruct a history of climatic and environmental change through a full glacial cycle, in order to improve our understanding of the natural processes that cause global climatic changes.

Inter-Congress Programme for the Loess Commission

The inter-congress programme for the Loess Commission is to investigate all aspects of loess related to climatic change, with particular emphasis given to the targets set in PAGES and also to North-South hemisphere correlation. The other major theme is to study practical problems related to loess - this ties in directly to one of the main themes of the Berlin 1995 Congress.

For Berlin the Loess Commission is proposing three symposia:

1. The Rudolf Grahmann Symposium - Loess in Europe
2. Loess Stratigraphy Worldwide
3. Practical problems related to loess

and a general discussion meeting:

4. Jade Mountain Project: New ideas on loess and the problems of data storage and dissemination.

Meetings: Two major meetings in the inter-congress period, and others with loessial connections and relevances:

1. 1993. The third International Geomorphological Congress will be held in Hamilton, Ontario in August 1993. This will include a symposium on 'The Geomorphology of Loess: Forms, Processes, Dynamics'. This is the major 'process' meeting of the Loess Commission for the next inter-congress period (contact E. Derbyshire at CLRD Leicester).
2. 1994. The major 'stratigraphic' and 'correlation' meeting will be held in New Zealand in 1994. It will be a joint meeting of the Loess, Tephra and Palaeopedology Commissions, related to the PANASH project, and designed to fulfil the INQUA directive that commissions should cooperate. Organisers are expected to be David Lowe (University of Waikato), Alan Palmer (Massey University) and Dennis Eden (NILE). We see this as a major meeting at which Southern Hemisphere stratigraphic data can be assembled and correlated for presentation at Berlin INQUA.
3. 1994 again. A meeting at Krasnoyarsk in Southern Siberia in August 1994. This meeting will be to honour the memory of Prof. Gromov, the famous palaeontologist. Organised by A. Dodonov of the USSR Academy of Sciences.

Marton Pecs: retiring President of the Loess Commission.

Marton Pecs took over as President of the Loess Commission at the Birmingham INQUA meeting (in the 1970s), and he handed over to An Zhi-sheng at the Beijing meeting (in the 1990s). For three inter-congress periods he guided the fortunes of the Loess Commission, and he hands them over in good shape. He succeeded Julius Fink, the founder and first president. When Fink set up the loess study group in the 1960s loess was just a small part of the Quaternary scholar's world; at Beijing in 1991 it could be seen to dominate all of Quaternary science. So Marton Pecs has presided over a great burgeoning of interest in loess, and we head towards the Millennium in an optimistic mood. This issue of LL is presented as a tribute to Marton Pecs, and a statement of thanks for his great efforts on behalf of the Loess Commission.

Ahmedabad 1992. International Symposium on the Evolution of Deserts. February 11-19 1992. Contact Dr. A.K. Singhvi, Physical Research Laboratory, Navrangpura, Ahmedabad 380 009, India. This will be the final meeting of IGCP 252 'The past and future of deserts' - the overall conference theme is 'Climatic Change in Deserts on different time scales'; the focal themes are: origin and evolution of deserts; geochronology of deserts; physics of desertification; man and desertification, and Aeolian processes.

Loess and computerised data-bases

LL is a small part of the operation of passing data from one loess investigator to another. LL is interested in the various on-line bibliographic systems, to see how they function in this regard. One or two observations can now be reported:

LL readers could consult the article entitled 'On-line bibliographic systems' by Duncan McKay, which appeared in Terra Nova vol. 3, no. 3, 1991. McKay lists the addresses of the major database hosts (organisations like DIALOG which connect you to a particular database) also lists the addresses of some database producers (e.g. Georeg, Geomechanics Abstracts, etc.). He lists four earth science databases: Geoarchive (Dialog File 58), Geobase (dialog File 292), Geomechanics Abstracts (Orbit File GMA) and Georef (Dialog File 89; STN File GEOREF; Orbit File GEOREF); and several multi-disciplinary databases and bibliographic databases.

LL has been carrying out a small investigation into on-line databases, with the assistance of the Pilkington Library at Loughborough University of Technology. Since November 1990 we have been investigating five databases: Georef (Dialog file 89), Geobase (Dialog file 292), Geoarchive (Dialog file 58), CAB Abstracts (Dialog file 50 and 53) and Geomechanics Abstracts (Orbit file GMA). Our keyword package focusses on loess in general, loess mineralogy and soil mechanics: a 'nature and properties' search rather than a stratigraphical or regional search. The literature is searched every two months and the usefulness and interest subjectively assessed.

Some general impressions. The whole package gives an exciting and provocative view of the loess literature; one is immediately made aware of the vast amount of loess research which is going on. File 50 CAB Abstracts (Commonwealth Agricultural Bureau) gives a good view of the soil science literature, which includes some interesting loess items, for example file 50 turned up the English translation of 'The origin of loess (modern developments of V.A. Obruchev's ideas)' by M.N. Alekseyev and A. Ye Dodonov (Int.Geol.Rev. 1989, 31 (12) 1216-1225). File 89 Georef dug up Rosalie Oefein's Master's thesis of 1933 and managed to detect Loess Letter Supplement No. 3, the Pyaskovskiy translation (still available from LL office). Files 50, 89 and 292 dominate; 58 Geoarchive, and Geomechanics Abstracts deliver fewer items. 292 Geobase turned up 'Review of the study of soil erosion on the Loess Plateau' by Chen Yongzong, J.Chinese Geography 1990 vol I(1) 95-107 (in English) - impressive that the system could locate the first issue of a new Chinese journal.

McKay believes that "properly conducted on-line searching can be extremely cost-effective and should not be the preserve of a small proportion of geoscientists employed in the private

sector". The LL continuous search operation, which depends on the cooperation of a well-organised and forward-looking library, can be judged a success because it shows items of significant material which would probably not have been encountered in any other way. This LL database study is part of the LAMBERT project (see LL25 for details).

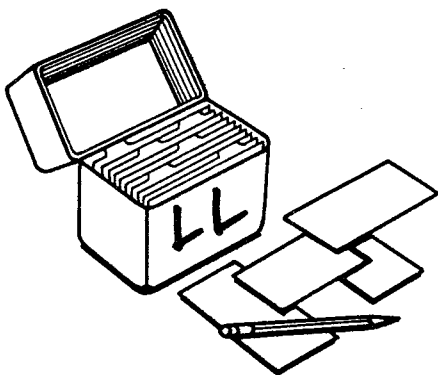
The Liu Tung-sheng Festschrift.

We now enter phase two of the Festschrift programme. Liu is now President of INQUA, a great loess scholar heads our organisation and the Loess Commission plans to mark this event by preparing a book called 'Loess and China: Essays for Liu Tung-sheng' to be presented at the 14th INQUA Congress in Berlin in 1995. We have some material (thank you to all contributors) but we need more. We need papers on all aspects of loess; carefully considered discussion papers which survey important fields or point to important problems or review areas of rich endeavour or give insights into loess in the world, or loess in China, or loess in a sample tube. We need essays on the wonder of loess, on the marvel of loess, on the evidence of loess, on the usefulness of loess, on bricks made with loess, on houses built of loess, on careers built on loess, on writers on loess, on the language of loess, on maps of loess

Send your contribution to Ian Smalley at CLRD Leicester.

Permafrost in Beijing 1993

The 6th International Conference on Permafrost will be held in Beijing 5 - 9 July 1993. For information contact: Professor Cheng Guodong, Lanzhou Institute of Glaciology and Geocryology, Chinese Academy of Sciences, Lanzhou 73000, China. Fax: 0086 931 485241. During the Permafrost conference the 4th meeting of the IGCP 297 Geocryology of the Americas will be held: project leader - Arturo Corte, P O Box 330, Mendoza, Argentina. Fax: 54 61 380370.



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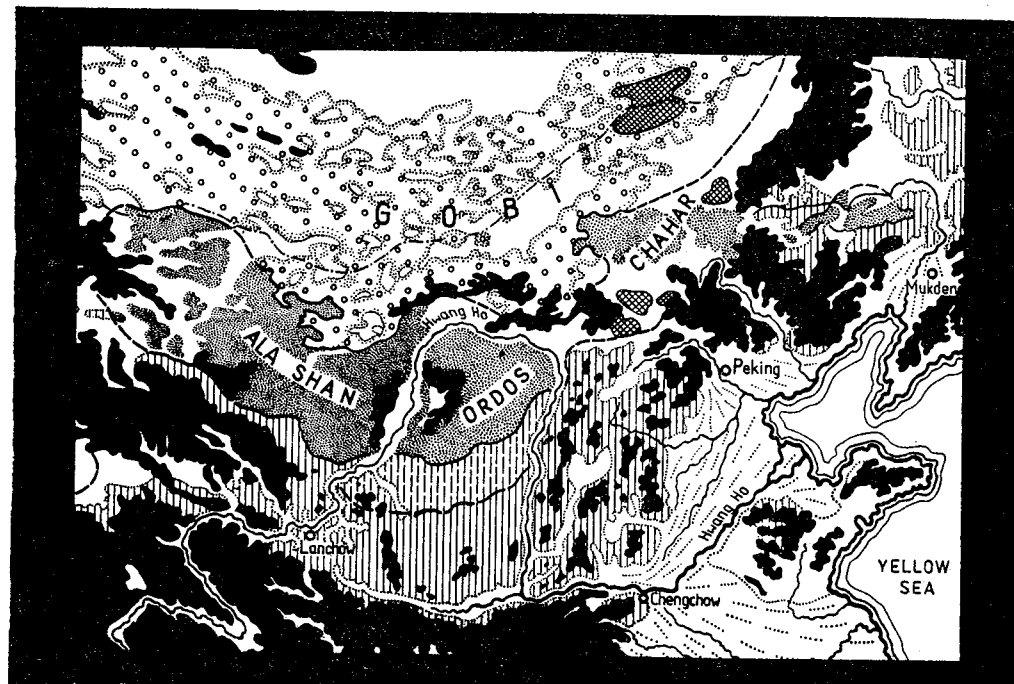
LOESS LETTER 26: OCTOBER 1991: ISSN 0110 7658

Polish Academy of Sciences
Department of the Earth and Mining Sciences

Stefan Zbigniew Różycki

Loess and loess-like deposits

Ossolineum



STEFAN ZBIGNIEW RÓŻYCKI

LOESS AND LOESS-LIKE DEPOSITS

EVOLUTION OF VIEWS ON THE GENESIS OF LOESS
CLASSICAL LOESS PROVINCES
LOESS OF THE WARM ZONE

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WROCLAW
1991

He also pointed out that colloids produced during the weathering processes coagulate already at the place of their formation, which is prompted by the presence of calcium cations and in this way explains the porosity of loess, creating conditions for further circulation of water. Lukashev's argumentation, however, was too theoretical and did not sufficiently take into account all the circumstances of the occurrence and chronology of loess. Nevertheless, his views are interesting because of their full awareness of the geochemical processes that may have operated in loess.

More consistent positions were taken by the advocates of the eolian theory, who persistently held up Obruchev's views, developing them and supplementing by new observations.

Trofimov (1945, 1950) and Lomonovich (1952) basing themselves on the observations from the basins of Tadzhikistan and Zailijskij Alatau, regard the loess of those areas as an eolian deposit blown away from the bottoms of desert basins. Among other things, they argued that the size of its grain decreases as it moves up the slopes of the surrounding mountains.

Fedorovich (1957), an outstanding investigator of the desert areas of USSR, took a stand similar to that of Obruchev. Using his own extensive observations and reconstructing the prevailing wind pattern on the basis of an analysis of eolian landforms in air photographs, he shows that the distribution of loess in Middle Asia and Central Europe depends on the prevailing wind directions. As the main factor determining the direction of eolian transport Fedorovich indicated great Central Asiatic high (Voyeykov 1895, 1927), vitally affecting the wind pattern in this part of the world throughout 10 months of the year. He also stresses the importance for dust transport of Atlantic cyclones blowing from above the North Sea and travelling across Central Europe, south of the Baltic Sea. After passing over Poland the cyclones spread wide to SE, E and NE over a considerable part of the Russian Plain. He also pointed to the reduction of fine-grained weathering products in desert areas, stressing in particular their eolian removal from large deflation basins. Fedorovich's argumentation is convincing for the supporters of the eolian theory, but the followers of Pavlov and Berg received it with reserve.

The situation became peculiar, because the continuous repetition of the same arguments by either side and rejection of the opponents' reasons inevitably ended in the discussion dying out. Each of the two groups acted independently, ignoring other opinions, and thus neither a definite solution nor a compromise was found.

New materials were gradually added by the representatives of other scientific disciplines, who had not had a direct share in the discussion.

An interesting achievement, which brought about a revision of the views on the role played by calcium carbonate in the loesses, was Rengarten's discovery (Rengarten, Konstantinova 1965; Rengarten, Hubka 1971), demonstrating that most hexagonal calcite plates occurring in loess are of organic nature and come mainly from calcareous algae living in a periodically humid steppe. A botanical analysis of this material has revealed a set of new, so far unknown, orders and families of algae.

An INQUA special on aspects of loess research is published in two joint volumes of Quaternary International, the Journal of the International Union for Quaternary Research (Vols. 7/8 1990). The first part (Volume 7) is dealing with 'Loess and the palaeoenvironment' and is edited by Marton Pecsí and Denes Lóczy. It contains a series of interesting contributions on topics such as: loess morphology, and sedimentology (Pecsí; Smalley; Leger); dating techniques (Lozek; Rutter, Ding, Evans, and Wang; Geyh; Zöller and Wagner); palaeosol analysis and the palaeoenvironment (Morozova; Bronger and Heinkele; Lozek; Rousseau; An, Liu, Lu, Porter, Kukla, Wu, and Hua; Rutter, Ding, Evans, and Wang; Velichko); and collapse phenomena in loess (Sajgalik).

In the second part (Volume 8) contains the official compte rendu of the XII INQUA Congress, and gives a full listing of the working groups and their members for the previous intercongress period (until 1991).

An outline of the first part of this special volume of Quaternary International is given in pages 11 to 17.

'Loess deposits in China', compiled by Zhang Zhongu, Zhang Zhiyi and Wang Yunsheng, and edited by Wang Xichuan was also published especially for the XIII INQUA congress. It contains a wealth of information on the sedimentology and stratigraphy of the Chinese loess. The book is based on the data collected by the authors through both field and laboratory investigations, and forms an addition to the discussion of the geomorphology of the Loess Plateau dealt with in the 'Geomorphological Map of the Loess Plateau (1:500,000) and Explanatory Notes' (Zhang Zhongu (ed.) 1986, Geological Publishing House, Beijing).

In this most recent book on the Chinese loess, a new stratigraphic classification and regional correlation of loess deposits is proposed, based on 30 years of Chinese loess investigations. The stratigraphic discussions cover Chapters 1 to 7. In Chapter 8 the Quaternary geological history and the palaeoenvironmental evolution of the loess deposits is discussed, while Chapter 9 focuses on the depositional structures. In Chapter 10 an attempt is made to solve the problem of the origin of loess. A formation model for loess in China designed by the authors is reproduced on page 18. The contents list of the book and figure 3 showing the location of the discussed profiles are shown on pages 19 and 20.

One of the most voluminous books published as a result of the XIII INQUA congress in Beijing is very likely to be the ABSTRACTS volume in which it has been attempted to present all contributions to the conference. A total of about 1750 abstracts are published in this volume. The emphasis on loess research world-wide, and especially in China, is reflected in the large number of loess related abstracts. A rough count of these abstracts gives us a total of about 250. In the following pages (21-28) just a few of these are mentioned, derived in a random mode from the ABSTRACTS volume. A more thorough discussion of the abstracts will be dealt with in LOESS LETTER SUPPLEMENT 24.

QUATERNARY INTERNATIONAL
The Journal of the International Union for Quaternary Research

LOESS AND THE PALEOENVIRONMENT

Guest Editors

Márton Pécsi and Dénes Lóczy

including

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FORTHCOMING TITLES INCLUDE

Protection and Evolution of Seacoasts

This Journal is abstracted in: *Geo Abstr*

LOESS IS NOT JUST THE ACCUMULATION OF DUST

M. Pécsi

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Most regrettably there is much misuse of terminology in connection with the concept of loess and the interpretation of its origin.

People often speak and write incorrectly about loess accumulation — even loess specialists who are aware of the fact that loess as a concept has to satisfy at least 10 criteria.

Loess is not simply dust carried and deposited by wind. Dust only becomes loess after the passage of a certain amount of time in a given geographical zone, i.e. only through diagenesis in certain ecological environments. To state that loess is of aeolian origin is an oversimplification and an incorrect definition because an aeolian origin applies only to the dust from which the loess has been formed.

We are aware of the fact that airborne dust cannot be transformed into loess in every geographical environment, but only under those conditions typical of semi-arid grassland or steppe or forested steppe. The process primarily occurs where the rate of dust accumulation exceeds sheet wash or weathering (soil formation) rates. If the rate of dust accumulation is less than that of surface erosion or of soil (biogenetic) processes, the dust then develops into soil or, through intensive weathering and increased precipitation, into loam or clay.

Only part of the aeolian dust transported and deposited in a zone suitable for loess formation remains there permanently and is transformed *in situ* into loess. Dust not affected by diagenesis is usually further transported by snowmelt or rainwash and is only transformed into loess after it has been redeposited. The loess itself, however, is easily erodible and its minerals are readily reworked and reaccumulated and, given the appropriate conditions, it readily undergoes diagenesis again.

We do not always have sufficient evidence to determine whether a given loess body is of primary or secondary origin. Traditionally, the minerals making up 'primary loess' have been regarded as originating in dust accumulated by aeolian processes. 'Secondary loess' by contrast is different from typical loess in many ways and it is not unusual to find various loess series in which superimposed dust fractions have been transformed into loess by different processes.

Recently we have observed that the origin of various types of loess is governed by differences in (litho) ecological conditions rather than by the way in which the mineral material from which the loess is derived (dust) has been primarily accumulated. Loessification is therefore determined by environmental conditions.

LOESS LANDFORMS

Michel Leger

University Paris VII, 2 place Jussieu, 75251 Paris Cedex 05, France

A thin loess layer only changes slightly the pre-loess morphology. A thick loess accumulation, however, can create original loess features, such as the loess-edge ramp in Saxony, a pattern of loess dunes forming parallel ridges or long ranges separated by troughs, which is present in many regions.

Among erosion landforms, gullies are the most common form — as well as the greatest hazard to the environment — to be found nowadays in loess areas, particularly those with the type of climatic conditions prevailing in continental steppes.

Last, some landforms of loess regions are the consequences of a long evolution and of a combination of many tectonic and climatic factors. Such landforms include the 'balka(s)' in southern Russia, and the loess plateau morphology in northern China.

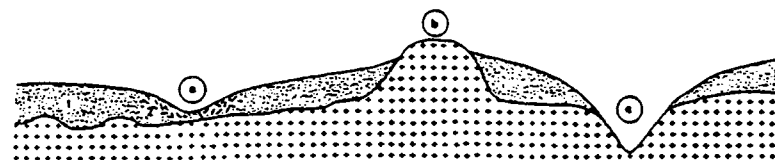


FIG. 1. Landform on loess-fossilized granite. (1) Recent loess; (2) recent gley loess. (a) a dell in loess, (b) non-fossilized hillock, (c) a dell in granite (Lautridou, 1985).

MAGNETOSTRATIGRAPHY OF THE BAOJI LOESS-PALEOSOL SECTION IN THE NORTH-CENTRAL CHINA LOESS PLATEAU

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The Baoji Section is judged to be the most complete, accessible Quaternary loess-paleosol section in the north-central China Loess Plateau: it is located 5 km north of the city of Baoji. It contains 37 paleosols and was recently named the type-pedostratigraphic section. The pedostratigraphic units (geosols) of the Baoji Section can be correlated throughout the Loess Plateau by a combination of magnetostratigraphy, and character, position and association of pedostratigraphic units. Magnetic properties were determined from 483 samples taken from 159 m of loess that overlies the Red Clay formation. All major reversals that occurred in the last 2.5 Ma were recorded. The Brunhes/Matuyama boundary occurs at a depth of 58.5 m within loess unit L₈, the Jaramillo Subchron between 72.0 m in loess unit L₁₀ and 76.4 m in paleosol S₁₁, the Olduvai Subchron between 125.5 m in loess unit L₂₅ and 131.5 m in loess unit L₂₇, and the Gauss/Matuyama boundary at 157.8 m within loess unit L₃₃, just above the contact with the Red Clay formation. This is the only known site where all major magnetic reversals are clearly defined in distinct field identifiable loess-soil units in one section. The magnetostratigraphy of the Baoji Section is thus recommended as the type section for the Loess Plateau.

RELICT FEATURES OF PALEOSOLS FORMED ON LOESS AND THEIR AGE

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Loess deposits of the last glaciation served as parent material for Holocene soil formation in the periglacial zone of the central Russian Plain. Recent (Holocene) soils as well as parent material contain textural features inherited from the last cryogenic phase of the Late Pleistocene. They are evidenced by detailed investigations of soil profiles carried out in the areas of development of the relict cryogenic microrelief. In the present study microstratigraphic methods were used to analyze the characteristics of soil profiles and their genetic horizons in trenches. Micromorphological studies in thin sections and radiocarbon dates indicate phases of Holocene development. Results acquired this way can be instrumental in age identification of distinguished soil features (since Late Pleistocene onwards).

THERMOLUMINESCENCE DATING OF LOESS — RECENT DEVELOPMENTS

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Thermoluminescence (TL) dating has developed into an important chronological method in loess research, especially beyond the range of radiocarbon dating. The principles and the present stage of the method applied to windborne sediments are summarized in this article. Advice to users is provided for appropriate sampling and handling of TL-samples as well as for measuring the natural radioactivity in the field. The potential and the limitation of loess TL-dating are discussed in terms of various case studies from Central Europe. In spite of the problem of age underestimation for old loess, TL-dating has already contributed greatly towards a better understanding of the loess stratigraphy and chronology. Thermoluminescence as a dating tool for archaeological samples has been established for 30 years. But the application of TL-dating to Quaternary sediments is — apart from some earlier attempts in the Soviet Union (Shelkopyas and Morozov, 1965; Dreimanis *et al.*, 1978) — a more recent development, essentially of the last decade (Wintle and Huntley, 1979). Since several review papers have already appeared on this subject (e.g. Wintle and Huntley, 1982; Mejdahl, 1986; Wintle, 1987; Singhvi and Wagner, 1986; Berger, 1988) the present contribution will only briefly mention the underlying TL-principles and the dating techniques, but will focus on the recent development in TL-dating of loess.

¹⁴C DATING OF LOESS

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Only indirect age determinations up to 50 ka BP can be carried out on loess using the ¹⁴C dating method. Organic materials such as charcoal, wood, and bones embedded in loess are suitable for dating. Soil horizons are less suitable due to the mobility of humic acids, which are used for dating. Snail shells constitute the best kind of organic carbonates for age determination. Loess concretions (loess kindl. calcrite) are frequently unsuitable as they may have been formed and/or diagenetically altered long after the loess was deposited.

Two dating techniques are available: radiometric detection (by liquid scintillation, proportional, and miniature counters) and accelerator mass spectrometry, which vary as to the amount of sample required (5–5000 mg carbon equivalent) and the dating costs (\$100–\$1000 per sample).

There are various problems inherent in the interpretation of ¹⁴C dates of Pleistocene loess samples. For comparison with absolute dates it must be kept in mind that ¹⁴C ages may be smaller by several thousands of years than the true ages: this is due to dendrochronological calibration problems which have not yet been satisfactorily solved for samples exceeding 10 000 years in age. Besides this, age deviations of several tens of thousand years may occur due to contamination with allochthonous carbon compounds.

In spite of these mentioned problems, ¹⁴C dating of samples found embedded in loess will continue, as material suitable for other dating techniques is often not available.

SAGGING OF LOESSES AND ITS PROBLEMS

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There exists disagreement in the world literature with regard to the characterization of sagging. The term sagging should be used solely in relation to loesses, and we define it as the process in which a sudden decrease of soil volume takes place. The factors which cause sagging are internal (genesis, geomorphological position, grain-size, content of soluble components, porosity, etc.) and external (shear stress, natural moisture, groundwater table, infiltration flow, etc.).

The mechanism of sagging is a very complicated process, which depends on many factors. In principle the process of sagging can be divided into three time phases, which succeed each other gradually. In the first phase there occurs the destruction of the original microstructure. The clay envelopes, bridges, and buttresses are disintegrated. In the second phase, the collapse of the microstructure takes place. Meanwhile the clay minerals, as well as the soluble salts and (partly) the oxides of metals, are leached from the soil.

After sagging, i.e. in the third phase, the soil acquires a heterogeneous structure, compared to the original homogeneous one. The relationships are changed between the individual structural elements. The size and the percentual representation of pores changes.

MINERALOGICAL AND CLAY MINERALOGICAL ASPECTS OF LOESS RESEARCH

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Mineralogical and clay mineralogical investigations under certain circumstances allow conclusions regarding the rate and kind of pedogenetic weathering, especially clay mineral formation. Together with soil physical and chemical and mainly micromorphological investigations, paleoclimatic conclusions can be drawn.

In Central European Holocene and Pleistocene loess soils as well as in relict loess soils in the central and northern part of the Great Plains of the U.S.A., smectite is the dominant pedogenetically formed mineral in the fine clay fraction (< 0.2 μm); illites are dominant in the coarse clay. In contrast in Holocene and Pleistocene loess soils of Central Asia (Kashmir Valley, loess plateau of Central China) mainly illites are formed pedogenetically and predominate in the coarse and fine clay fractions. Even in intensively weathered and rubefied Earthy Braunerlehms (RhodudalFs) of mid and old Pleistocene age, no, or only very small amounts of kaolinite were formed pedogenetically.

LOESS-PALEOSOL FORMATION ON THE RUSSIAN PLAIN

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The East European loess province is the largest one not only in the Northern Hemisphere, but also on the Earth. The chronostratigraphic scheme for this province was worked out on the basis of data obtained by different research methods. Accumulation of loess like deposits began at the end of the Pliocene in the post-Akchagilian time. Deposition of silt material and loess formation began in the second half of the Eopleistocene. During this period up to the Holocene (about 1 Ma), 6 interglacial soil complexes can be identified. According to paleomagnetic data the Brunhes-Matuyama boundary occurs within the Don Loess, which corresponds to maximum (Don) glaciation of Eastern Europe. The composition of the loess-paleosol complex of the Middle Pleistocene is much more complicated; there are 3 interglacial soil horizons overlain by the Middle Pleistocene moraine of the Dnieper glaciation. A well-developed interstadial soil horizon (Bryansk Soil) can be distinguished within the Late Pleistocene formation (32-26 ka BP). The structure of the loess-paleosol complex varies over different regions of the East European loess province. These differences can be shown on a new type of map: that of loess-paleosol chronocomplexes.

THE LONG-TERM PALEOMONSOON VARIATION RECORDED BY THE LOESS-PALEOSOL SEQUENCE IN CENTRAL CHINA

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The loess-paleosol sequence in Central China during the last 2.5 Ma is a good record of the Asian monsoon variation, which could be considered as the concrete realization of global paleoclimatic cycles. The geological and biological evidence of the loess-paleosol sequence indicates that the loess was mainly the dust deposits transported by the northerly wind of winter monsoons and also suffered to some extent from pedogenesis caused by weakened summer monsoons, and that the paleosol accreted by the rather slow dust accumulation was closely related to strengthened summer monsoons. An alternating occurrence of loess and paleosol in the Luochuan section implies the variation history of warm-humid climate with a summer monsoon dominance and cold-dry climate with a winter monsoon dominance. The magnetic susceptibility of loess and paleosol can be regarded as a proxy index of Asian monsoon variation. An analysis of the susceptibility curve and structure characters of Luochuan section shows that the Asian monsoon circulation was strengthened from Early Pleistocene to Late Pleistocene, and the 500 ka BP point and 1200 ka BP point seem to be a threshold and a turning point respectively in terms of the long-term paleomonsoon variation in Asia.

POSSIBLE FORMATION MECHANISMS FOR THE MODAL COARSE-SILT QUARTZ PARTICLES IN LOESS DEPOSITS

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The first major event in the formation of a loess deposit is the production of silt-sized quartz particles. Many particle production methods have been proposed: the bulk of loess particles appear to be produced by (a) glacial grinding (to give ice-sheet loess) or (b) cold weathering in high regions (to give mountain loess). There are close relationships between mountain loess and 'desert' loess. Loess material can be seen as a product of the cold phase of the glacial cycle.

MOLLUSCS IN LOESS, THEIR PALEOECOLOGICAL SIGNIFICANCE AND ROLE IN GEOCHRONOLOGY — PRINCIPLES AND METHODS

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The malacofauna of genuine wind-blown loess consists of a minor number of tolerant species occurring mostly in high amounts and reflecting open habitats with poorly developed calcareous soils. It shows a rather uniform character in space and time distinctly differing from all present-day assemblages of the temperate zone, and thus indicating a very peculiar environment characteristic of the loess steppe. In protected areas, particularly on valley slopes, the loess covers alternate with intercalations of slope sediments and soils including several other types of snail assemblages reflecting environmental changes in the course of the Quaternary climatic cycle. Among these malacocoenoses the interglacial faunas are of prime biostratigraphic importance. They are associated with strongly weathered forest soils and indicate woodland environments under very damp and warm climatic conditions. Transitional steppe and taiga assemblages occur in buried chernozem soils and in various slope sediments, e.g. in the pellet sands, overlying the interglacial soils and corresponding to early glacial periods.

Although the fauna of proper loess shows a monotonous composition, it is possible to distinguish several types of loess assemblages corresponding to minor facies changes of loess environments in time and space; these are, for example, the *Pupilla*, *Helicopsis striata* and *Columella* faunas of Central Europe. A peculiar marshland fauna characterizes the so-called swamp-loess deposited in ephemeral swamps. In the marginal zones of the loess belt there occur also faunas partly differing from those of typical loess; this is true particularly of the Mediterranean region. The most important contribution provided by molluscan faunas from the loess series is the evidence of the maximum number of climatic cycles during the Quaternary period.

STATISTICAL ANALYSES OF LOESS MOLLUSCS FOR PALEOECOLOGICAL RECONSTRUCTIONS

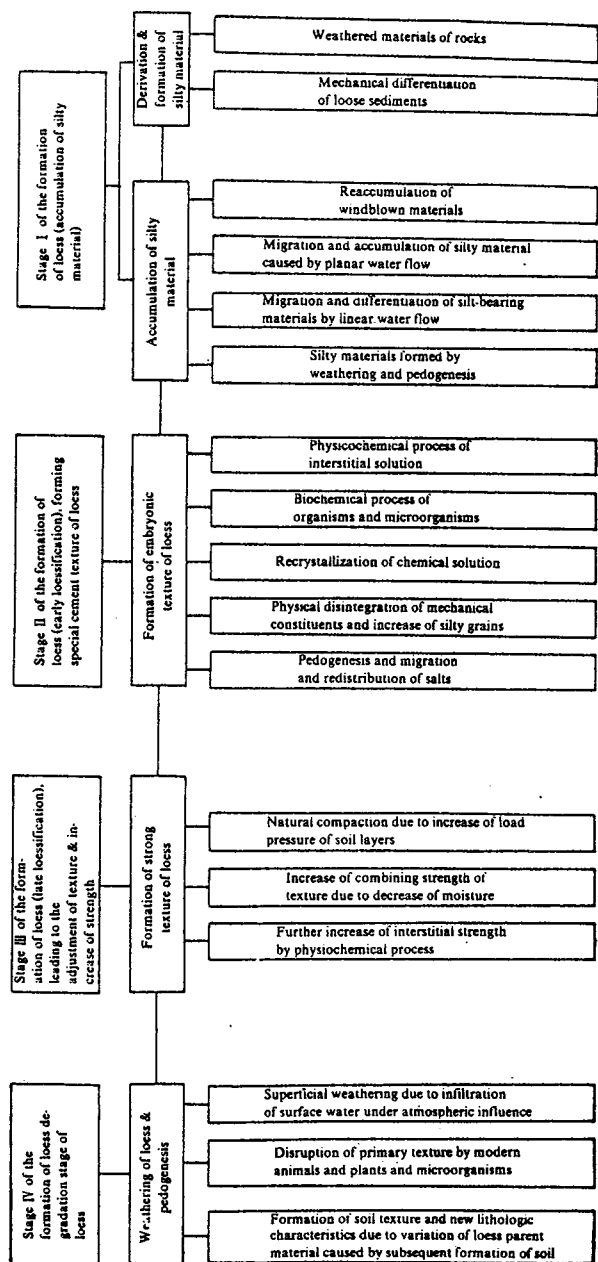
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Molluscs remains are generally numerous in loess sequences and a rich literature deals with them. But since the proposal of Lozek's method which is widely used in Quaternary molluscan studies, no new methods have been proposed apart from some adjustments. It is a fundamental fact that to propose a new approach implies consideration of the studied material with other concepts. Nevertheless to renew existing methods and concepts needs the opportunities of new techniques, new physical supports but also depends on the scientific hard core of scientists. The generalization and the rising power of computers and micro-computers was one opportunity for the geosciences. More precisely, the renewal of concepts in paleontology leads to new hard cores based on multidisciplinary approaches implying a quantification of data. That is the reason why morphometry appears in evolution studies, quantitative paleoclimatology firstly developed on marine micro-organisms, quantitative paleoecology to characterize the different type of associations, quantitative biostratigraphy — all these approaches widely using multivariate methods. Concerning Quaternary molluscs, I have attempted to develop new concepts because these organisms allow precise studies dealing among others with evolution, biogeography, climatology, and biostratigraphy. They are generally present in the loess sequences which record several climatic cycles, that is to say variations in geosphere-biosphere relations. Consequently analyses of loess molluscs are able, using statistical analyses, to contribute to the understanding of the geosphere-biosphere system.



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Preliminary Study on Climatic Periodicities Recorded in Baoji Loess Section, Chinese Loess Plateau

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Abstract

Magnetic Susceptibility measurement was conducted at every 10cm interval in Baoji section, a 160m thick loess deposit in southern Loess Plateau. An independent time scale was developed under paleomagnetic and TL controls by assuming a constant deposition rate for every loess-paleosol formation. The 1600 susceptibility data were then plotted to the time scale which has a 2.5 Ma basal age from paleomagnetic measurement. Fourier analysis of the susceptibility time series shows strong spectral peaks near quasi-periods of 400,000, 100,000, 40,000 and 20,000 years, coinciding with the astronomical theory of paleoclimate. According to theoretical computation, the 400,000 and 100,000 years quasi-periodic oscillations are forced by change of the eccentricity of the Earth's orbit, 40,000 years period by the obliquity of the ecliptic and 20,000 years period by the longitude of perihelion with respect to the moving vernal point. The climatic periodicity recorded in the loess section is a function of the time interval considered; the 0-0.8Ma sector is dominated by the quasi-100,000 years period, the 0.8-1.6Ma interval by 40,000 years cycles and the 1.6-2.5Ma span again by 100,000 years period.

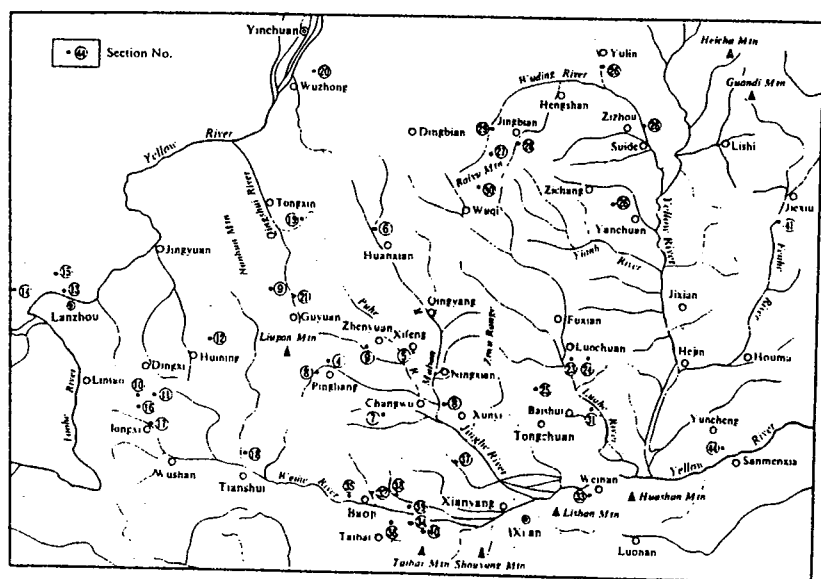


Fig. 3. Locations of typical stratigraphic sections in the middle reaches of the Yellow (Huanghe) River (Nos. of sections are the numbers of figures given below).

SURFACE TEXTURES OF SILT-SIZED QUARTZ GRAINS IN LOESS: A KEY TO ITS ORIGIN?

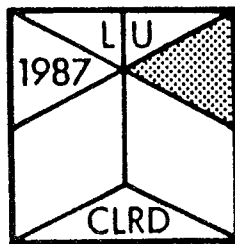
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ABSTRACT

Loess samples from Lanzhou, Gansu Province, P.R. China, consist for the greater part of quartz grains, which can be found both in the clay size and silt size ranges. In our study of the surface texture we concentrated on the silts sized particles. Single grains were extracted, mounted and described using a Scanning Electron Microscope (SEM). It was found that a great variety of surface textures exist, ranging from particles with relatively undisturbed cleavage patterns to particles which are variously smoothed, pitted and irregular. *In situ* formation of such a wide range of single particle features would seem to be highly unlikely. Therefore, an hypothesis is presented in an attempt to explain the relationships between surface textures and the origin of these loess particles. Since particles are rarely derived from unweathered rocks, differences exist in the intrinsic properties of quartz particles in the source rocks. In some rocks a higher degree of interpenetration of the quartz surfaces by other minerals is observed, resulting in a surface which is less resistant to weathering. Additionally, small impurities, including hydrolysed bonds, reduce the strength of quartz considerably.

Before the loess particles were deposited after their final aeolian transport, several transport routes, involving a variety of transport mechanisms, can be distinguished. Glacial grinding, periglacial weathering and other processes created loess particles with different types of surface textures. Mechanical action may round larger grains, but smaller grains in particular tend to cleave and retain their flat shapes. Abrasion of the loess particles as a result of aeolian transport plays only a minor role. Smoothing of particles may result from solution and precipitation. However, prolonged weathering results in a porous appearance.

On the basis of the description of a large number of particle surfaces and the comparison of the surface textures within one sample, the multi-stage sequence from source to present deposit will be discussed. It is argued that particles can be trapped in either of these stages for a long period, and that the present loess deposits are a mixture of particles with highly varying ages.



ON THE PROBLEM OF THE DETAILED CORRELATION OF THE LOESS-PALEOSOL STRATIGRAPHIC SCALES OF CENTRAL ASIA AND CHINA

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The summary sequence of the loess formation of Central Asia (up to 200 m, ~2.2 Ma) is compiled on the detailed loess-paleosol sections of Tajik depression, Tashkent, Kopetdag and Alma-Ata regions (Lazarenko et al. 1977-89) and includes 42 regional stratigraphic units, among them the recent soil (Holocene), 19 loess units (L) and 22 paleosol complexes (S). S1-17 belong to Pleistocene (up to 1.6 Ma), S18-22 to Pliocene. The main datum is M/B reversal between S9 and S10. Jaramillo event includes interval with S12-13, Olduvai - S18-19. The Brunhes zones includes 11 excurses.

One of the most important results of the detailed regional correlation (in the scale of absolute geochronology) is that the main climatic changes and even oscillations were practically synchronous all over Central Asia. This conclusion can also be confirmed by the data on interregional correlation of the loess-paleosol sequences of Central Asia and China, and oxygen isotope scale of oceanic sediments of the Western Pacific.

The loess-paleosol scale of China can be transformed to practically identical to that of Central Asia if two main corrections would be made: 1) to divide S5 into two independent soil units, 2) to recognize the stratigraphic independence of the less expressed paleosol in the loess unit L7 (between S6 and S7). In the result, the total number of paleosol units (as well as the loess ones) in the Brunhes zone would increase to 9, and the boundary between Q₁ and Q₂ would be at the base of new S10 (old S8). Some more correlations can be proposed for the lower parts of sequences: L11 (Cent. Asia)---L9 (China present day scale); S13---S11 (S10?); S18+S19---WS3 (WS2?).

Such a uniformed chrono- and climatostratigraphic scale which fits the whole territory of Asia (within the latitudes 35-45°N) may serve a basis for compiling a general (subglobal) scale of the Pleistocene for the large part or even the whole continent of Asia.

MODELS OF AEOLIAN SILT DEPOSITION IN THE UPPER QUATERNARY OF SOUTH AMERICA

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CONICET - Paraná - Argentina

The climatic changes occurred in South America during the Quaternary provoked deflation and deposition of large masses of silt, which formed loess and loessoid units of regional extension in several areas of the continent. An analysis of the most important Late Pleistocene and Holocene loess and loess-like deposits resulted in the identification of five types of transport and deposition. They are: 1) Periglacial - It originated the typical Pampean loess, in Argentina and Uruguay. Winds derived from the Patagonian ice field transported in NE direction silt and fine sand formed by frost action, forming a large sand sea and a loess belt behind it.

2) Chaco type - During the Late Pleistocene, minor temporary streams transported frost-originated silt from the Cordillera to the lowlands in south Bolivia and NW Argentina. Dry tropical north winds deflated the sediments to the south, forming a valley and plain loess deposit.

3) Originated in subtropical anticyclones - During the Upper Holocene, a stational anticyclonic anomaly produced a semiarid climate and dry winds, which eroded the Pleistocene loess and deposited a thin, 600.000 Km² large, loess carpet in the Argentine plains and surrounding regions.

4) Originated in trade winds - In the Llanos del Orinoco (Colombia and Venezuela), the NE trade winds deposited a silt mantle during the dry Late Pleistocene. Materials came from the Guyana Shield.

5) Volcanic - Several layers of a loess-like sediment, composed of partially altered volcanic ash, cover the Interandean Valley in north Ecuador.

Loess-Red Clay Formation in central China
---- A Terrestrial Record of Geomagnetic Field and East Asian Monsoon Variations for the Last 5.0 Ma

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The Quaternary loess(-paleosol) sequence and the underlying red clay formation recorded the East Asian monsoon variation while magnetostratigraphy of the sequence provided a reliable time scale for it. Loess accumulation in the central Loess Plateau started shortly after the M-Ga polarity transition while the loess-red clay boundary in Xi'an clearly extended into the Gauss chron suggesting a basal age of 2.5 Ma for the loess sequence. The magnetic field reversals such as Ga/Gi, M/Ga, B/M and subchrons in each chron recorded by the loess-red clay sequence can be correlated clearly with the polarity time scale of Mankinen et al. (1979). In addition, the continuous accumulation and high deposition rate of this sequence made it possible to identify two short geomagnetic excursions such as BMpc (0.80 Ma BP) and Cobb. Mtn. (1.12 Ma BP).

Many recent studies on lithology, particle size analysis, anisotropy of magnetic susceptibility and fossil microfossils indicated a large amount of eolian silty deposit in the red clay formation. The paleosol within it is similar to that in the loess sequence and contains argillic and illuviated calcareous horizons reflecting seasonal climate condition. The alternation of paleosols or weathered layers and grey-yellowish silty sediment recorded the climatic changes of dry-humid, though not so apparently as the loess sequence did. The strengthening of monsoon climate from 3.4 to 2.5 Ma BP was displayed by the transition from the lower red clay with a high proportion of calcareous nodules to the upper red clay with evident alternation of paleosols and thin silty layers. Strengthening tendencies of winter monsoon circulation characterised by accelerated silty accumulation and summer monsoon circulation recorded by generally intensified pedogenesis were apparent after 2.5 Ma BP.

EVOLUTION OF THE ENVIRONMENT IN THE CENTRAL EUROPEAN
LOESS BELT DURING UPPER PALAEOLITHIC TIMES.
SYMPOSIUM VII - GEOARCHAEOLOGY.

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During the last ten years, research on Upper Pleistocene loess of the Central European plain was mainly focusing on sequences directly related to archaeological occurrences. More especially, 23 Upper Palaeolithic sites, selected in Southern Poland, Czechoslovakia, Austria and Hungary, have provided a consistent chronological background for the main part of the loess sequence of the Last Glaciation, which has been supported by at least 60 coherent radiocarbon datings.

As a whole, this study confirms the existence of two main periods of loessic sedimentation under cold and rather dry climate, corresponding respectively to the Lower and Upper Pleniglacial. In between, occurs a set of highly differentiated loamy and loessic deposits, including several paleosols, which are undoubtedly related to more humid climatic conditions and incorporate most of the palaeolithic occupations. Particularly, the chronological data provided by the latest Gravettian settlements are indicative of a non-synchronous distribution of the main loessic sedimentation at the beginning of the Upper Pleniglacial. In a similar way, the scarce presence of Palaeolithic hunters in the Central European loess belt during the Upper and the Lower Pleniglacial must probably be ascribed to the large extent of the very dry loessic environment, not very attractive for large herbivores, rather than to the occurrence of extreme cold climatic conditions at that time.

IS THE ABRUPT CHANGE IN ASIAN MONSOON CLIMATE
RECORDED IN THE BAXIE LOESS PROFILE ON THE
LOESS PLATEAU OF CHINA CORRELATIVE WITH THE
YOUNGER DRYAS OSCILLATION?

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A 15-m-thick loess section at Baxie, near the western margin of the Loess Plateau (103.6° E, 35.6° N), records evidence of a brief climatic reversal at the end of the last glacial age. On the basis of profile development, ¹⁴C (organic humin) and TL (loess) dating, and measurements of grain-size distribution, organic content, magnetic susceptibility, and $\delta^{13}\text{C}$ of organic carbon, the history of Asian monsoon variations in this area can be reconstructed. Between 17,000 TL yr B.P. and 13000 yr B.P. a dry winter-type monsoon climate dominated, resulting in deposition of 5.00 m of loess (15.00-10.00 m depth). Before 13,000 yr B.P., however, the moist summer monsoon began to strengthen, gradually at first, and then very rapidly after 12,400 ¹⁴C yr B.P. until 10,870 ¹⁴C yr B.P. The latter interval is represented in the profile by a paleosol with relatively high magnetic susceptibility. After this period, the impact of the summer monsoon abruptly diminished and dust influx increased as the climate again became dominated by dry winter-monsoon conditions. During this interval 1.25 m of loess (9.25-8.00 m depth) was deposited which is characterized by coarse grain size, low organic content, low magnetic susceptibility, and relatively high $\delta^{13}\text{C}$ values, reflecting a cold, dry climate and a desert-steppe landscape. Above this loess unit is a paleosol complex ca. 3.10 m thick (8.00-4.90 m depth) that marks a shift to warm, humid climate and a steppe-forest landscape which characterized the region until about 6,000 yr B.P. Subsequently, the summer monsoon weakened and the rate of pedogenesis decreased. Radiocarbon (humin) ages for the top of the lower paleosol (10,870±270 yr B.P.) and the near base of the higher paleosol complex (10,230±220 yr B.P.) bracket the 1.25-m-thick loess unit and mark the beginning and termination of the brief late-glacial interval of drier, colder climate. Its beginning seems to have lagged the onset of Younger Dryas conditions in the North Atlantic region, but the ¹⁴C ages imply that the event does fall within the generally recognized limits of the Younger Dryas interval (ca. 11,000-10,000 yr B.P.). If these radiocarbon ages are correct, and the Baxie climatic oscillation is causally related to the Younger Dryas episode, then the apparent lag in the onset of the event in China remains to be explained.

CLIMATIC RECORD AND ITS SIGNIFICANCE OF THE LOESS AT THE CONTIGUOUS REGION BETWEEN QINGHAI-KIZANG PLATEAU AND LOESS PLATEAU

Chen Fahu & Li Jijun *

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The studied region is the main deposit center of the loess of China. The loess is very thick. In some loess profiles, it's more than 250 m thick. It is up to 320 m thick with 300 m typical loess in Jiuzhoutai profile near Lanzhou city, the thickest loess profile in the world. The loess is also widely distributed in the region from altitude of 1500 m to 3700m. Another characteristics of the loess stratigraphy is that it contains more palaeosol layers than in other regions in a same time scale. In recent years, we have been studying the loess to record global climate and East Asian monsoon climate. The primary conclusions of our researches to loess record over the last 1.40 Ma are as follows:

1. There are 43 palaeosol layers developed in the loess stratigraphy. They are formed not only in interglaciation but also in interstade, and several palaeosol layers may be formed in a interglaciation or interstade, indicating that the loess-palaeosol is more sensitive to climatic changes than in other regions.

2. The magnitudes of climatic changes tend to increase, but the frequencies tend to decrease. The climate had a tendency to become warmer and moister in interglaciations but colder and drier in glaciations in north China over the last 1.40 Ma.

3. There are twenty-four complete loess cycles since about 1.40 Ma B.P.. Loess cycle has the same meanings as glacial cycle.

4. The climatic changes recorded in the loess stratigraphy have 42 ka, 22 ka, 102 ka and 19 ka main cycles. It seems that the global climatic changes are mainly controlled by variations of earth orbital parameters.

5. The climate record by loess-palaeosol is generally consistent with ocean record. The ages of odd and even stages of oxygen isotope are same as susceptibility ages of palaeosol and loess layers in second unit.

6. The loess record over the last glacial cycle can be compared with that of Vostok ice core of Antarctic.

7. Summer and winter monsoon of East-Asian tend to become strong and strong respectively in interglaciations and glaciations since about 500 Ka.

KEYWORD LOESS in the SCIENCE CITATION PERMUTERM INDEX.

The SCI view of a year's work in loess.

LOESS

ACCUMULATI. SHEN CD
ACQUENHEIM - ROUSSEAU DD
ALASKA - WESTGATE JA
ALASKAN - BEGET JE
ALSACE - ROUSSEAU DD
AMINOSTRAT. - ALFORD JJ
CLARK PU
ANALYSIS - FLEHMIG W
ANISOTROPY - LIU XM
AQUIC - FLEHMIG W
BALANCE -
BE-10 - SHEN CD
BURIED - BUSACCA AJ
C-CYCLE - NIEDER R
C-3-PLANTS - WANG XC
C-4-PLANTS -
CEREALS - BAUMGART.G
CHEMICAL-C. - MCINTOSH PD
CHINA - BRONGER A
- LEI XY
- LUK SH
- WANG XC
CHINESE - LIU XM
- ZHOU LP
CLIMATIC - ROUSSEAU DD
CULTIVATED - NIEDER R
CURRENT - WINTLE AG
DATING -
DECOMPOSIT. - NIEDER R
DEVENSIAN - PREECE RC
DISTINGUISH - MCINTOSH PD
EARLY - PALMER AS
EASTERN - BUSACCA AJ
- MCINTOSH PD
FAUNA - PREECE RC
FEDERAL-RE. - BAUMGART.G
FERTILIZER -
FORCING - BEGET JE
FORMED - MCINTOSH PD
FRANCE - ROUSSEAU DD
GANSU-PROV. - WANG XC
GENESIS - BRONGER A
GERMANY - BAUMGART.G
GLACIAL - PALMER AS
HAPLUDALF - FLEHMIG W
HILLS - WANG XC
HISTORY - PALMER AS
INDEXES - LEI XY
INTERIOR - WESTGATE JA
INTERPRETED - BUSACCA AJ
IR-PHASE - FLEHMIG W
KENT - PREECE RC
LAST - PALMER AS
LATE - BEGET JE
- PREECE RC
LISHI - LUK SH
LONG - BUSACCA AJ
LOWER - BAUMGART.G
LUOCHUAN - BRONGER A
MAGNETIC - ZHOU LP
MAGNETIC-S. - BEGET JE
- LIU XM
MATERIAL - FLEHMIG W
MEANS -
MICROMORPH. - BRONGER A
MIKROTEXTU. - LEI XY
MISSISSIPPI - ALFORD JJ
- CLARK PU
MOLLUSCAN - PREECE RC
MULTIPLE - BUSACCA AJ
N-CYCLE - NIEDER R
NEW-ZEALAND - MCINTOSH PD
- PALMER AS
- PILLANS B

NW - WANG XC
ORIGIN - LIU XM
- ZHOU LP
PALEOCCLIMA. - BEGET JE
PALEOCCLIMATE - PILLANS B
PALEOSOLS - BRONGER A
- BUSACCA AJ
PART - BAUMGART.G
PARTLY - ZHOU LP
PEDOGENIC - BAUMGART.G
PHOSPHATE - LEI XY
PHYSEDEMEC. - WESTGATE JA
PLIOCENE-P. - BAUMGART.G
PROPERTIES - LEI XY
QUATERNARY - ALFORD JJ
- BEGET JE
- BUSACCA AJ
- CLARK PU
- LIU XM
RECORD - BUSACCA AJ
- PILLANS B
- ROUSSEAU DD
- WESTGATE JA
RECULVER - PREECE RC
REGARD - NIEDER R
RELATIONSH. - LEI XY
REQUIREMENT - BAUMGART.G
RESEARCH - LIU XM
- WINTLE AG
REVIEW -
SAXONY - BAUMGART.G
SECTION - BRONGER A
SEQUENCE - ROUSSEAU DD
SIGNIFICAN. - LIU XM
- NIEDER R
SOIL -
SOILS - BAUMGART.G
- LUK SH
- MCINTOSH PD
SOUTHERN - BAUMGART.G
SOUTHLAND - MCINTOSH PD
SPATIAL - LUK SH
STRAW - NIEDER R
STRENGTH - LUK SH
SUGAR-BEETS - BAUMGART.G
TEMPORAL - LUK SH
TL - WINTLE AG
TYPES - LEI XY
USA - BUSACCA AJ
USE - MCINTOSH PD
VALLEY - ALFORD JJ
- CLARK PU
- BEGET JE
- LUK SH
- ZHOU LP
VEGETATION - PALMER AS
- WANG XC
WAIRARAPA. - PALMER AS
WASHINGTON - BUSACCA AJ
WHEAT - NIEDER R
XEROPHILIC - WANG XC

LOESS

LOESS (CONT)

YELLOW-RV. - WANG XC
3-MY - WESTGATE JA
350,000-YE. - ROUSSEAU DD
500,000-YE. - PILLANS B

LOESS-DERIVED

ALI C
- THOMPSON ML

LOESSES

BALEKSEEV MN

LOESSIAL

BEDEN DN

51911

To follow these up

consult the

SCI Source Index.

黄



黃 𡗗 炎 𡗗 黃

This pictograph is not easy to interpret. It shows a man with a lighted torch and the earth: the yellow of the flame and the soil. The latter may refer to the fertile loess deposited for centuries by the Yellow River on the lands in its basin. It is a warm, bright colour, a vital force. The yellow of the sun and the earth became, under the Qing dynasty (1644–1911), the colour reserved for the Imperial House, a symbol of the Son of Heaven, who was responsible for the fertility or aridity of the land. There is another, less plausible explanation: that the man holding the torch is a miner searching for the yellow metal, gold.

The radical with the character for “legumes” creates “sesame seed”: a bright yellow cereal. With the character for “gourd” it produces “cucumber.” The characters for “earth” and “yellow” together form “loess,” the alluvial soil that covers the Huáng Hé river valley and has made it into a very fertile area. Juxtaposed with the character for “jade,” in the sense of “precious stone,” this radical forms “topaz,” a stone whose most common type is bright yellow.

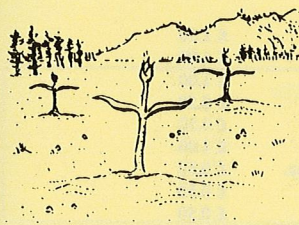
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— 十 艹 艹 艹 艹 艹 艹 艹

1 1
黄 黄



- 黄豆 Huáng dòu *sesame seed*
 黄瓜 Huáng guā *cucumber*
 黄土 Huáng tǔ *loess*
 黄玉 Huáng yù *topaz*

土

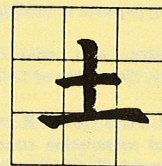


土 土 土 土 土

The book *The Three Characters* contains the following lines: “water, fire, wood, metal and earth are called the five elements, to which all things owe their origin.” Earth is thus one of the five sources of nature. It is enough to look at the network of fields of modern China to understand how strongly the Chinese feel this link with the earth.

This radical is formed of three strokes: the upper one is the crust of the earth, which can be cultivated; the lower one is the subsoil, stony but fertile; the vertical stroke represents all the things that emerge from the subsoil to the surface, all the fruits of the earth. This radical, with the addition of that for “heart,” and the character for “hand” above it, means “strange,” “unusual.” It used to convey the idea that the hand of the man working the earth transformed it. Combined with the characters for “hand” and “sun,” it describes the action of making clay figurines. Originally it symbolized earth worked by man and then left to dry in the sun. This was the way in which the first containers were created. In the *History of the Song Dynasty* (960–1279), this radical was used in the sense of “local,” “native.”

— | —
2 3 2
— 十 土



- 怪 Guài *strange*
 捏 Niē *to work clay*
 土人 Tǔ rén *native*
 土话 Tǔ huà *local dialect*

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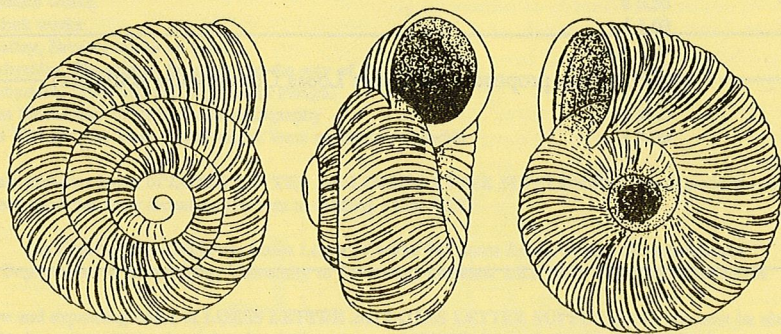


FIG. 3. *Vallonia tenuilabris* (A. Br.).