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Early Permian fossils from southern Tibet, like faunas from Peninsular India and Lesser Himalayas of Garhwal

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Abstract

Attention is drawn to the discovery by Chinese geologists of fossils in Tibet like those of the Umaria marine bed of Peninsular India, and in the Bijni tectonic unit in the Garhwal Himalayas. The fauna demonstrates a close geographic relationship between the three regions.

Introduction

The major Chinese Scientific Expedition to the northern slopes of Mt Everest (Jolmo Lungma or Qomolangma), in 1966–1968 found Permian faunal sequences that were mostly correlated with the Maokou faunas of southern China, (Zhang and Ching, 1976) matching and indeed belonging in part to the *Lamnimargus himalayensis* Zone of the Himalayas, recognised by Waterhouse and Gupta (1977). The Chinese commented on the apparent lack of rocks and faunas equivalent to the Chihsia rocks and faunas of south China or the Talchir Boulder bed of India. This implied that early and early middle Permian stages, from Asselian to Kazanian, were not present, as is the case also over much of the Himalayan Tibetan Zone to the west, except in Kashmir. In 1975, a new Chinese team found early Permian faunas north of Mt Everest, and the fossils are described by Ching Yukan *et al.*, (1977). Their work is of particular interest to the present authors because they have described a fauna very like that of the Umaria marine fauna, which we also have recognised in the Himalayas, *in the Bijni tectonic unit of the Garhwal, in the Lesser Himalayas.*

Stratigraphy

The Umaria-like fossils come mainly from the Chi-Lung or Jilong Group, for which a typical cross-section is provided at Mt Chi-Lung-kun-pa-hsi of Ting-erh county.

The strata from top to bottom are:

Cha-ya sandstone quartzite section

5. Sandstone quartzite (thickness 300-400 m)
4. Fine sandstone slate with sand (thickness 250-300 m)

Section containing *Stepanoviella*

Sandy fine sandstone section

3. Fine sandstone quartzite containing broken fossils (thickness 0.5-1 m) Collection Jifi

Cha-ta-erh miscellaneous boulder rock section

2. Miscellaneous boulder rock (ihickness = 30 m) Collection Ji6c

Chu-tsung group

1. shale, sandy shale

Locality Ji fi yielded brachiopods, *Nuculopsis,* coral and trilobite fossils and locality Ji6c yielded Radiolaria, corals and brachiopods. Brachiopods: *Lissochonetes* cf. *geinitzianus* (Waagen), *Lialosia* sp., *Waagenoconcha* sp., *Stepanoviella gracilis* Ching, *Attenuatella convexa* Armstrong, *Martinia* sp., *Trigonotreta* cf. *narsarhensis* (Reed), *Punctospirifer jilonjica* Ching; 2. Corals: *Empodesma* sp.; 3. Nuculopsis: Myalinidae gen. et sp. indet.; 4. Trilobites: Ditomopyginae gen. et sp. indet.; 5. Radiolarians: *Staurosphera* sp., *Spongotripus?* sp., *Dorysphaera* sp., *Flustrella* sp. etc.

Ching Yukan *et al.*, (1977) discussed the age, and noted that the Lung-ling Series in Lang-tai of Kweichow Province had somewhat similar fossils. They agreed that a Sakmarian age was likely. Waterhouse and Gupta (1977) pointed out that the Umaria bed with *Stepanoviella* could also be matched with a *Stepanoviella* faunule in Afghanistan, of early Sakmarian age (Termier *et al.*, 1974). The occurrence of *Attenuatella* in the Tibetan sequence is of particular interest. This genus occurs in

TABLE I. Comparative fossil lists from Lesser Himalayas, Peninsular India and Tibet

Umaria	Garhwal Himalayas	Mt Everest
?Orthotichia sp.		
	Streptorhynchid	
	Chonetid	?=Lissochonetes cf geinitzianus
	Coronalosia blijniensis	?=Lialosia sp
		Waagenoconcha sp
	Cancrinella cf farleyensis	
Stepanoviella umariensis		Stepanoviella gracilis
	?Anidanthus sp	
Cleiothyridina sp.		
		Attenuatella convexa
Brachythyrinella narsarhensis	=Brachythyrinella cf narsarhensis	=B cf narsarhensis
	Neospiriferinae indet	
Tomiopsis barakaiensis		
	Spiriferinidina indet	Punctospirifer jilongica
Janeia aff biarmica		
Eurydesma sp.		
	?Atomodesma sp	Myalinidae indet
	Etheripecten sp	
	Streblopteria sp	
	Streblochondria sp	
	Deltopecten sp	
Peruvispira umariensis		

The degree of equivalence is not established

Canadian sequences of the Yukon Territory in the basal and top Asselian Stage and in the middle Sakmarian Stage, and apparently in rocks of comparable age in east Siberia (Waterhouse 1976). Judged from the nature of the associated fauna, *Attenuatella* in Canada marked cool episodes. But in the New Zealand sequence, *Attenuatella* entered the succession during warm episodes (Waterhouse, 1976), suggesting that a warm climate in the New Zealand Permian approached a cool climate in the north Canadian Permian. Not enough is known of the Himalayan sequences to judge whether *Attenuatella* penetrated there during relatively cold or warm climatic intervals. The Tibetan form was matched with an Australian species, but the Australian record for *Attenuatella* is at the moment not clear. Overall, sum of the data of the three stations must be considered to oscillate between an early and middle Sakmarian age, but *Stepanoviella* seems to be basal Sakmarian in both Afghanistan and in Western Australia. The report of the boulder beds may or may not imply a possible glacial horizon.

A second and somewhat comparable fauna is found with *Stepanoviella* aff. *umariensis* (Reed), *Punctospirifer, Syringothyris nagmagensis* Bion and *Deltopecten* in Pangtowulullungmachula of Linchow County. This horizon occurs in slate and grâvels and fine sandstone, below barren 130 m of speckled sandstone, found in turn below limestone 480 m thick with *Neoschwagerina margaritae* Deprat and other fossils including *Compresso-productus mongolicus* Diener (found elsewhere at Chitichun no. 2 in south Tibet).

Palaeogeography

The faunas from the three stations are somewhat similar to each other, on a paleontologic though not a statistical basis, and may be adjudged as belonging to one biozone, dominated and linked by *Brachythyrinella narsarhensis* (Reed). Samples are not sufficient as yet to decipher how many fossil communities are represented, but it seems likely that all three belonged to one geographic region, under a more of less similar climatic regime. This must imply in turn a relatively narrow latitudinal spread, within 5° to 10° in our experience, for species may range widely along latitudes but not far across latitudes, to an extent that is now being calibrated on the basis or generic assemblages by J.B.W. Although the three stations came from different tectonic units, namely the Indian segment of the Gondwana foreland, the Garhwal nappe, associated and originating according to Shanker *et al.*, (1973) south of the Krol Nappe suite, and the Tibetan zone, the original latitudinal spread would appear on this basis to have not been reduced by very much—one may speculate by no more than 1° to 3°, if that.

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REVIEW

'GEOCHEMISTRY OF COLLOID SYSTEMS FOR EARTH SCIENTISTS'.
by S. Yariv and H. Cross. Springer-Verlag, New York, 1979. p. xii+450, 86 figures.

This book is a brilliant compilation wherein the latest concepts have been reviewed in the field of Colloidal Chemistry as obtained in the Geochemical systems of the Earth. The various chapters cover a large field of allied subjects and hence there is more material than what the title implies. A good background in physical geochemistry and crystal chemistry is essential to follow the text.

After a preliminary introduction to the subject, the authors give examples of geologic systems where colloidal chemistry is applicable (eg. Fluidised beds, magma, air-water interface on oceanic surface, aerosols etc.). The physical chemistry of surfaces is explained in the 2nd, 5th and 8th chapters. The 3rd, 4th, 6th and 7th chapters deal with the minerals and their reactions with water at low temperature (including weathering, clay minerals, silica etc.). Rheology of colloid systems and colloid geochemistry of argillaceous sediments are dealt in chapters 9 and 10 respectively.

References are up to 1977 and contain mostly those of late 1960s and late 1970s. Whether it is Bowen's principle of reaction series or the reverse of it (Goldich's principle), they are treated in a comprehensive manner and interpreted in the light of latest thinking. The individual chapters are carefully compiled and the authors were meticulous to get them reviewed from experts in respective fields spanning from France, UK, Israel, Australia, Canada and USA. The result is exceedingly good and the coverage very authentic. Several problems are presented from a new angle (eg. on evaporation at p. 117, solubility of clay minerals p. 314, reactions of clay minerals *vs* organic compounds chapter 7), It is but natural that very minor faults creep into expression while dealing with subjects of various fields. For example the groundwater table is defined as 'the level where the draining water comes to rest' (p. 36). Such sentences can hopefully be corrected and made more precise in subsequent editions.

This is a welcome addition to low temperature geochemistry and crystal chemistry and will serve as a good source of latest reference material. This book is very useful to clay mineralogists and soil scientists also.

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