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### Sinian Biota in China

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Since the 1970s, Precambrian metazoans and metaphytes, such as macro-algae, soft-body fossils, sponge spines, skeletal fossils and trace fossils in the whole Sinian biota have been studied in China, except stromatolites and microplants. A series of biotas or floras have been set up in different localities, including the Huainan biota, Liaonan biota, Lantian flora, Miaohu biota, Gaojiashan biota and Xilingxia biota. In order to carry out a more intensive study of Precambrian palaeontology and genetic stratigraphy, facilitate an intercontinental correlation of those biotas and explore the origins and histories of various phyla in the Phanerozoic, it is advisable to adopt the concept of the "Sinian biota", which includes various types of metazoans found in China. In order to avoid using many other local terms to designate typical biotas of the same ages, the authors summarize and describe the features of the main assemblages of the Sinian biota and their evolutionary characteristics and stratigraphic correlation, and sum up their geographic and stratigraphic distributions.

**Key words:** Sinian biota, metazoans, mega-algae, Precambrian strata

### The Discovery and Significance of Cool-Water Brachiopods from Shiqiantan Brachiopod Fauna in Junggar Basin, Xinjiang

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The authors have recognized four genera of cool-water brachiopods in the Shiqiantan brachiopod fauna in the Junggar basin, Xinjiang. They are *Praehorridonia*, *Pseudosyrinx*, *Orulganina* and *Spiriferinaella*. In addition, two new species—*Praehorridonia gitaiensis* Wang et Yang sp. nov. and *Spiriferinaella mirabilis* Wang et Yang sp. nov. have been erected. The Shiqiantan brachiopod fauna has the features of a cool- and warm-water mixed fauna and it is advisable to assign the fauna to the Boreal realm in the biogeographical division. The Junggar basin might have become a part of the southern margin of the Siberian plate in the early stage of the Late Carboniferous.

**Key words:** Shiqiantan, cool-water brachiopods, palaeobiogeography, southern Siberian plate, Junggar basin

### The 3-d deformational movement episodes and neotectonic domains in the Qinghai-Tibet Plateau

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The formation of the Qinghai-Tibet plateau has progressed through four partly overlapped tectonic episodes. The  $\alpha$  episode mainly witnessed NS shortening and northward movement in 45–35 Ma. This was followed by a long period of slow uplift, i.e., the  $\beta$  episode, from 35 to 5.3 Ma. The  $\gamma$  episode was a short period of rapid uplift that started 5.3 Ma ago and reached its culmination after 3.0 Ma. The  $\delta$  episode was characterized by E–W extension. It occurred before 3.0 Ma in the Himalaya area and spread to the whole plateau after 3.0 Ma. Extension became a dominant mode of deformation movement in the Quaternary. On the basis of the inhomogeneity of tectonic deformation in space and time in the  $\gamma$  and  $\delta$  episodes, the

Qinghai-Tibet plateau is divided into three tectonic domains, Tibet, Qiangtang and Qaidam.

**Key words:** Qinghai-Tibet plateau, deformational movement, displacement rate, neotectonic domain

#### **On the Xuzhou-Suzhou Arcuate Duplex-Imbricate Fan Thrust System**

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There is an arcuate thrust sequence protruding toward west on the west side of the Tancheng-Lujiang fault in the border area of Jiangsu, Shandong, Henan and Anhui Provinces. The thrust system consists mainly of a hinterland-dipping duplex in the east and a piggyback type imbricate fan in the west. Remnants of the roof thrust left by erosion together with a series of listric faults dipping to the east can be seen on the surface. The floor thrust can be shown to exist by the disappearance of the thrusts at depth as a result of the treatment of gravity and magnetic data. Thrusting attenuated west of the Baitu and Huajiahu area so that a piggyback type imbricate zone developed. The arcuate thrust system may be divided into three segments by the E-W-trending Bulaohe fault and the north Suxian fault, which is thought to be produced by the northwestward push of the Shuanggou nappe between the Bengbu uplift and the Fengxian-Peixian uplift in the oblique convergence of the North China plate and the Yangtze plate on the monoclinical basement. The thrust system is complicated by later back thrusts, foredeep gravity sliding structures, four finger-shaped Mesozoic-Cenozoic hinterland depressions, NW-trending faults and intermediate and acid intrusions. If all these overprintings are eliminated, the outline of the duplex would be made clear. Since the thrust system was formed in inclined rocks by intermittent thrusting during repeated tectonic movements, more complex folds and faults in the strata comprising the roof thrust and the horses resulted. Also it is wedge-shaped. So it is different from the simple model proposed by Boyer and Elliott. It is more common and more representative.

**Key words:** Xuzhou-Suzhou, arcuate structure, duplex, imbricate fan, thrust system

#### **A-type Granites in Maotan, Anhui**

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The Maotan granite, situated on the south side of the Tongbu-Shanlidian deep fault in Anhui province, is a compound intrusion composed of fine-grained granite, granite-porphyry, middle-grained granite and coarse-grained granite. Their K-Ar ages are  $99.28 \pm 1$ ,  $97.36 \pm 1$ ,  $91.80 \pm 1$  and  $85.46 \pm 1$  Ma, respectively. Granitic, quasi-porphyritic, graphic and granophyric textures are recognized in these rocks. Main rock-forming minerals are K-feldspar, quartz, biotite, plagioclase and albite. Quartz phenocrysts are mostly corroded, showing round and irregular embayed shapes. Biotite is filled in the interstices of other minerals, and some of it gather to form nodules. From fine-grained granite through granite-porphyry and middle-grained granite to coarse-grained granite the contents of quartz and K-feldspar increase and plagioclase decreases, the contents of  $\text{SiO}_2$ ,  $\text{Na}_2\text{O}$  and  $\text{K}_2\text{O}$  increase and  $\text{Al}_2\text{O}_3$ ,  $\text{MgO}$  and  $\text{CaO}$  decrease,  $\Sigma$  REE becomes high, and the Eu anomaly becomes more pronounced. Compared with other types of granites, the Maotan granite is characterized by higher Si, K+Na, LREE, Y, Nb and Zr and lower Al, Mg, Ca, Ni, Cr, Ti and V; so it is similar to A-type granites in the world, especially to those in Gabo and Mumbulla, Australia, and Shouzhou and eastern Zhejiang, China. Besides, the rocks contain abundant accessory minerals such as magnetite, fluorite, apatite, zircon, anatase, cyrtolite and hematite with minor moissanite which might be derived from the mantle. The crystal form of zircon is characterized by the development of the tetragonal pyramid (111) and tetragonal prism (110). The mean points and mean TET of

the zircon populations are plotted in the mantle field, and the crystallization temperatures of the granites range from 850–900°C, which is similar to the case of the Shuzhou A-type granite and different from the case of I-type granites. On the basis of the above, the Maotan granite belongs to A<sub>2</sub>-type named by Eby. It may be concluded that the Maotan granite originated by intrusion of highly differentiated mantle magma along the Tongbu–Shanlidian fault.

**Key words:** A-type granite, geochemistry, zircon crystal form, petrogenesis, Maotan, Anhui

#### **Sulphosalt Minerals and W–Sn Sulphides in the Bitian Cu–Au–Ag Deposit, Fujian**

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The Bitian deposit is a Cu–Au–Ag deposit related to late Yanshanian subvolcanic rocks. Many sulphosalt minerals and W–Sn sulphides have been discovered in copper ores of the deposit. They are zinc tennantite, bismuth tennantite, bismuth tetrahedrite, tellurium–tennantite, aikinite, wittichenitem enargite, chatkalite, mawsonite and kiddcreekite. The copper ores occur in early Yanshanian granites. Most sulphosalt minerals are rich in bismuth. They are intergrown with chalcopyrite and bornite. The Bi content of the minerals varies in the range of 9.441–42.815%. Kiddcreekite is intergrown with mawsonite, and both commonly contain the trace element Ge. These minerals form at the chalcopyrite–bornite–pyrite stage of the early mineralization phase. The formation temperature of these minerals varies between 260–380°C, the lowest ore-forming pressure is 20–40 MPa and the sulphur fugacity  $\lg f_{S_2}$  is –8.74–12.06. Many boiling inclusions have been discovered in the copper ores. Their salinities vary greatly from 3.4 to 33.26 wt% NaCl, while their homogenization temperatures vary in a very narrow range. The boiling of fluids is an important factor for the formation of the sulphosalt minerals and W–Sn sulphides. The discovery of many Cu–Bi sulphosalt minerals and W–Sn sulphides suggests that some ore substances in the mineralizing fluids of the deposit might come from early Yanshanian granites.

**Key words:** sulphosalt minerals, tungsten–tin sulphides, copper–gold–silver deposit, Bitian, Fujian

#### **Geological Anomaly and Mineralization in the Middle Lower Yangtze River Valley Area**

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In this paper the authors apply the theory and method of geological anomaly to the qualitative and quantitative analysis of types and features of geological anomalies in the middle–lower Yangtze River valley area, and discuss the time–space relations between Fe–Cu–Au deposits and various types of geological anomalies. The results demonstrate the following: sedimentary anomaly is a major factor leading to the formation of stratabound deposits; the central anomaly zone of uplift and subsidence controlled by crustal uplift and subsidence supplied favourable space and ore-forming material for deposits; the complex anomalies of structures controlled zoning and spatial localization of deposits; the anomalous evolution of Mesozoic magmatite was a necessary geological process for mineralization and enrichment of ore-forming elements; the time–space distribution of Fe–Cu–Au deposits was restricted by the anomalies of space–time distribution of magmatic rock; and the anomaly of geological assemblage entropy, one integrated variable expressing the favourable degree of mineralization of various kinds of geological factors, can be used as an evaluation indicator of mineral quantitative prognosis.

**Key words:** geological anomaly, Fe–Cu–Au deposit, time–space distribution of ore deposits, quantitative prognosis, middle–lower Yangtze River valley

**Background of Ore Element Abundances of the Basement and Granite in the Middle and Lower Reaches of the Yangtze River and Adjacent Areas**

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The paper systematically deals with the background of ore element abundances in the basement rocks and granitic rocks in the middle and lower reaches of the Yangtze River and adjacent areas. Studies on the background of ore element abundances may offer a set of geochemical data for metallization of copper, gold, tungsten, tin, etc. These data have been used as a window through which we may peep at the crust composition and time-space evolution of metallization. Studies show that the enrichment mechanism of ore elements such as copper is weak in sedimentation, metamorphism and magmatism of anatectic granite of the upper crust in the east part of the Yangtze blok. So deep magmatism (volcanism) should be the leading enrichment mechanism of ore elements like copper in the middle and lower reaches of the Yangtze River.

**Key words:** basement, granite, ore element abundance, middle and lower reaches of the Yangtze River and adjacent areas

**Laboratory Thermal Simulation of Liquid Hydrocarbon Generation and Evolution of Jurassic Coals from the Turpan-Hami Basin**

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Laboratory thermal simulation on liquid hydrocarbon generation and evolution of the Jurassic humic coals from the Turpan-Hami basin was carried out by means of dry-pyrolysis in absolutely sealed system. The results revealed that the coals give similar features of liquid hydrocarbon generation and evolution: the productivity of  $C_{12}$ +THCs changes a little at the lower maturation stage of  $R_o=0.40\%-0.65\%$  (original to  $420^\circ\text{C}$ ), while a peak of pyrolysate productivity occurs at the stage of  $R_o=0.5\%$  ( $240^\circ\text{C}$ ) and a "valley" (mainly caused by polar fractions) occurs at the stage of  $R_o=0.58\%-0.59\%$  ( $300-360^\circ\text{C}$ ); the significant increase of  $C_{12}$ +THCs begins at  $R_o=0.65\%$ ; the peak productivity of  $C_{12}$ +THCs appears at  $R_o=1.09\%$  ( $540^\circ\text{C}$ ) and hydrocarbon breakdown happens extensively at the overmature stage of  $R_o=1.94\%$  ( $600^\circ\text{C}$ ). In addition, the variations of the important geochemical parameters such as saturates / aromatics ratio,  $\text{Pr} / \text{Ph}$ ,  $\text{Pr} / n\text{C}_{17}$ , and  $\text{Ph} / n\text{C}_{18}$ , as well as n-alkane distribution were studied in detail. The variations of these parameters are closely related to that of the pyrolysate productivity and also to that of the natural maturation series of coal. The simulation demonstrated that the generation and expulsion of liquid hydrocarbons (coal-derived oil) from the typical Jurassic humic coals should mainly occur at the maturation stage ( $R_o=0.65\%\sim 1.09\%$ ).

**Key words:** Turpan-Hami basin, humic coal, coal-derived oil, liquid hydrocarbons, thermal simulation, maturation stage