Geoscience Canada

IGCP 280

W. A. Padgham

Volume 21, numéro 2, june 1994

URI : https://id.erudit.org/iderudit/geocan21_2con03

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Éditeur(s)

The Geological Association of Canada

ISSN

0315-0941 (imprimé)
1911-4850 (numérique)

Découvrir la revue

Citer cet article

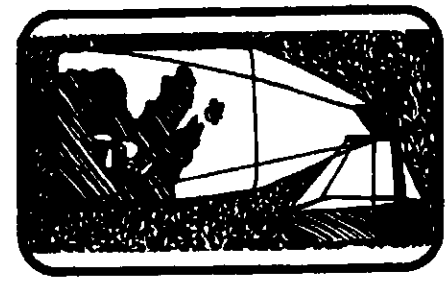
Padgham, W. A. (1994). IGCP 280. *Geoscience Canada*, *21*(2), 92–94.

peoples had a much more restricted diet from almost exclusively terrestrial sources, whereas the Mesolithic people had, in addition, exploited marine resources. Residues on ceramics from sites in northern Manitoba indicate that the flat plates were probably used to fry fish and other foods. At Wadi Halfa, Nubia, the skeletal isotope ratios suggest little change in the food from the Christian to the Meroitic Periods (~100-1600 CE), except that males in the Meroitic and X Group cultures ate more meat than females. A strong trophic level shift in $\delta^{15}N$ ratios in children of approximately 5-7 years of age suggests that weaning occurred then. Isotopes in their hair suggest that more people died in the early summer and that their summer diet was almost exclusively millet and sorghum, while their winter diet was almost exclusively wheat. We do know, however, that they did store food, which should have averaged the isotope ratios more over the year. More research is needed into hair growth rates and possible fractionation.

Marie Conrad (SUNY, Buffalo) introduced us to the horrors of life in the poorhouse in mid-19th century New York State. Historic accounts give conflicting reports on the nutritional state of inmates, ranging from "well fed" to"suffering 1000 different diseases ... [all called] starvation." In order to examine the nutritional state of skeletons preserved in the Highland Park collection, she will examine paleopathologies, stable isotope chemistry, and some trace element chemistry.

Ezra Zubrow thanked all the speakers for attending and presenting their research, and the sponsors, including the Canada/America Trade Centre and SUNY (who currently cover speakers' hotel and food costs). Zubrow also invited all the speakers to contribute their papers to a new, fully electronic journal, *Anthro,* being edited at SUNY Buffalo. The conference program will also appear in this journal, which is currently free upon request from apyezra@-UBvms.cc.buffalo.edu. Further information is available over email or by writing Professor Ezra Zubrow, Department of Anthropology, SUNY Buffalo, Buffalo, New York, United States 14222.

As always, SUNY Buffalo hosted a great meeting, with plentiful, interesting science, useful discussion, and good food. The only complaints heard by the attendees concerned the fact that the third session occurred during the Olympics gold medal Olympic hockey game, and that some beer seemed to have a $-3‰\delta^{15}N$ signature. The organizing committee, especially Doug Perrelli, deserve congratulations for a smooth conference. The organizers are always looking for new topics, and new scientists to present them. If you are involved in archeometric research, please contact Ezra Zubrow. SUNY welcomes all interested attendees.



IGCP 280

W.A. Padgham
NWT Geology Division
Department of Indian and
Northern Affairs Canada
P.O. Box 1500
Yellowknife, N.W.T. X1A 2R3

On 29 August 1993, the final meeting of the International Geological Correlation Programme (IGCP) Project 280 convened in Beijing, China. Following a day of mainly sightseeing in Beijing, foreign delegates and their Chinese hosts entrained on the evening of 30 August for an overnight trip to Shenyang. After breakfast in the railway station, we drove on one of China's very few freeways to Anshan, an iron and steel mining and smelting town in Liaoning Province, 1 000 km northeast of Beijing and three hours from Shenyang. (China's highways are not nearly as well developed as her railway system. We found that road travel was generally slow. Speeds of 50 km/hour could rarely be maintained for more than a few minutes because of the narrowness of the roads, and because of pedestrians, bicycles and tractor-drawn one-ton trailers that appeared in great numbers near every town and village. The tractors are slow and low-powered, and as they will not, or cannot move over, traffic crawls past towns and villages. From their abundance and the fact that they were usually filled with stone, gravel, sand or dirt, one gained the impression that much of China was under construction.)

Everywhere we travelled, the people seemed relaxed, well-dressed and well-fed, and were universally friendly and polite. In the countryside, people seemed to have more time and were obviously interested in whatever the foreigners were doing. One European geologist who has worked for many years on China's old rocks suggested China is

unique among third world countries in that people in the countryside are significantly better off, and have larger houses, than do people in the cities. Police and the military were conspicuously absent. At Qianan we were driven about in five mini-busses led by a police car with siren and flashing red lights. This had no effect whatsoever; pedestrians, bicyclists, and tractor drivers appeared totally indifferent and made no effort to facilitate our passage. Only the foreigners were impressed.

The meeting was attended mostly by scientists working on the geochronology and evolution of Early Archean rocks, including two geologists from each of Australia, Britain, Japan and South Africa, and one geologist each from Brazil, Canada, France, Germany, Russia and Sweden. Most were isotope geochemists, petrologists or geochronologists. Chinese participants were mainly from the Institute of Geology of the Chinese Academy of Geological Sciences, a Chinese government organization that has jurisdiction over economic geology and the geology of mines and mineral deposits. Two Chinese from the Institute of Geology of Academia Sinica, two from Northwest University, and one from each of six other Chinese organizations took part in various parts of the program. Geologists employed by the iron-steel companies, hosts in Anshan and Qianan, accompanied us on our field trips.

Northeast China, where the oldest rocks in Asia are exposed, is a broad plain dotted with hills and small mountains. Outcrop is found only around the sides of the hills and, except where quarried, the rocks are deeply weathered and covered with abundant growth. Chinese geologists rarely see extensive fresh exposures of Archean rocks and, as it is difficult to correlate between such scattered outcrops, relationships are not well defined. Thus, in spite of the fact that these *ca.* 3.8 Ga gneisses are relatively accessible, limited exposure and lack of continuity may be an insoluble impediment to a complete evolutionary story. Most of the rocks we saw were upper amphibolite and granulite grade, but many show evidence of polyphase metamorphism, and a case was made for some having been retrograded from granulite. The non-Chinese geologists who had worked in the area argued that there was essentially one group of rocks, all originally of upper amphibolite to granulite grade, with scattered zones of retrogression. This contrasted with the explanation favoured by the Chinese, who held that the lower grade rocks were part of a different sequence. This disagreement is one reason for the two different field guide sections, one by Chinese and another by Australians.

Two-and-a-half days were spent in the Anshan area. The first afternoon began with an overview of a large open-pit iron mine in amphibolite grade Archean gneisses. Here, magnetite-quartz banded iron formation (BIF) is blasted from a nearly 3 km long *ca.* 2.5 Ga apparently(?) lying on 3.01 Ga granite and intruded by a 2.47 Ga granite. Later, we visited small rock quarries that expose the contact between 3.8 Ga supracrustal rocks and 3.3 Ga granite. It was emphasized that the older rocks form only a small part of the basement in the Anshan district, and are thus hard to find. On one outcrop, Allan Nutman (Australian National U. (ANU)) emphasized the care needed to avoid contamination in zircon geochronology as he attempted to collect a large sample to check a potentially spurious date he had obtained on zircon concentrates provided from a Chinese laboratory. The danger of correlating relative age with strain or with metamorphic grade was also emphasized. The value of the sensitive high resolution ion microprobe (SHRIMP) as a tool for reconnaissance geochronology of the complex, commonly isotopically disturbed zircon populations typically found in Archean rocks — particularly gneisses and detrital sediments — was also emphasized. Dating of numerous crystals, as is necessary when searching for the youngest component of a sediment that permits the oldest probable depositional age to be determined, is simple with the SHRIMP, as is dating of the multi-component zircons typically recovered from migmatites and gneisses. Reconnaissance with the SHRIMP can rapidly determine if the numerous true granite bodies of a region are of the same age, or, as has been shown for a number of Precambrian areas, represent repeated evolution and intrusion. Dating of strongly layered gneisses has shown some to be the same age as nearby weakly foliated granites (from which they have been derived by shearing), rather than older crustal components.

In spite of detailed information from individual outcrops, data does not yet permit a decision on whether, in the Anshan area, Archean history is one of reworking of a block of crust formed at *ca.* 3.8 Ga, or, if the older phases are a minor component, within an assemblage of unrelated crustal blocks. It was interesting to see the relative abundance of 2.5 Ga- to 3.0 Ga-age granite (*sensu stricto*) with fractionated REE patterns and negative Eu anomalies. Such rocks are interpreted to have formed by remelting of older crust. This seems almost a duplication of the Acasta situation, where Bowring has found similarly evolved granites, although of significantly older age (4.0--3.4 Ga), that must be derived by intracrustal and not mantle melting. He suggests evolution of the early earth was, therefore, characterized by large volumes of enriched crust and a complementary depleted mantle.

In the Qinang area of eastern Hebei Province, Archean granulite and amphibolite facies gneisses of very complex lithologies were visited. Here, biotite-bearing pyroxene granulites, acid metavolcanics, amphibolites and ultrabasic rocks are all "intruded" by charnockitic gneisses. Metasedimentary layers in this area include calc-silicate, fuchsitic quartzite, abundant BIF, and minor marble. Magnetite-quartz iron formation is mined from numerous relatively small pits, mainly by truck with rail-haulage from the pits to nearby reduction works. As the BIF is a granulite grade, it is extremely coarse-grained and easily beneficiated. In spite of the great importance of the iron mines of Qinang and Anshan, magnetometer surveys have never been flown in this area. Perhaps none have been done in China, as the geologists of the Academy and of the steel companies seemed unaware of their potential value.

The quartzite near Qinang contains the oldest zircons yet found in China (3.85-3.82 Ga), which implies that sialic crust was present in the Sino-Korean Craton as early as 3.85 Ga. As the quartzite also contains zircons dated at 3.68-3.66 Ga, it likely represents erosion of granitoid crust as early as 3.6 Ga. The presence of similar metasedimentary rocks of like age in a number of Archean Cratons (Slave, Greenland, Sino-Korean) suggests that at least as early as 3.6 Ga, Archean Cratons of unknown extent were being eroded to produce quartzites and carbonates of

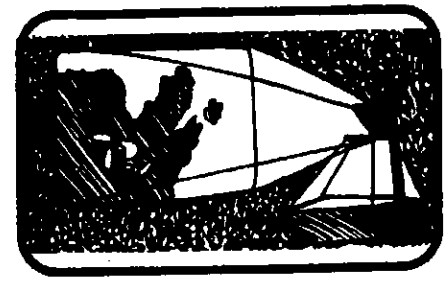
an Archean equivalent to the orthoquartzite-carbonate suite of the Phanerozoic.

After two days in Qinang we returned to Beijing by highway, visiting the Quin Tombs on the way, and lunching on a magnificent ten-course northern Chinese meal at a restaurant near the tombs. As at the Forbidden City, which we had visited previously, and the Great Wall two days later, the site was extremely popular with Chinese tourists.

Back in Beijing, a one-day technical session was held in our hotel. Papers were presented on the Archean of Australia, Brazil, China, Greenland, North Korea, Siberia and South Africa. As was found on the field excursion, language differences were a drawback to free communication. Most of the young Chinese scientists have rudimentary English, although senior scientists (those who are now essentially retired) seemed to be fluent, if rusty, in English. Needless to say, the foreigners were unable to communicate in Chinese.

Interesting papers included one by Bor-ming Jahn (Rennes, France) on the geochemistry of Archean basalts and komatiites and early crust-mantle differentiation and tectonic styles in the Archean. A paper entitled "Whirl Tectonics" by Bai Jin of Tianjin Institute of Geology and Mineral Resources was an interesting attempt at a non-plate tectonic model for Archean tectonics. His model suggests that plates existed in the Early Archean, but were too small to be effectively subducted. Hence, they became pushed together, with, of necessity, considerable relative rotation to produce many curved structures and linears. The title in its English translation is a bit unusual, if not unfortunate. Dirk van Reenen (and others from Rans Afrikaans U.) talked about mylonites in the Limpopo belt, emphasizing that mylonites are the products of deformation and not of "metamorphism," and contrasted them with "straight gneisses," which reflect the effects of (commonly deep) recrystallization under high-grade metamorphism. The South Africans have not copied the "trendy" use of mylonite that has prolifereated in North American literature. Clark Friend (Oxford Polytechnic) and Alan Nutman (ANU) shared the podium on a paper describing the terrane assembly of southern West Greenland, where evidence for accretionary amalgamation of diverse Archean Terranes seems very convincing.

IGCP Project 280 has now ended. A special issue of *Precambrian Research* is planned to document some of the progress made through this project. It has been suggested that a successor project to continue the focus on the world's oldest rocks would be welcomed by the IGCP. Canada is a logical candidate to develop such a successor project.



GSA Looks Again at Earth Science Education: Barriers II

E.R. Ward Neale
5108 Carney Road N.W.
Calgary, Alberta T2L 1G2

INTRODUCTION

This Geological Society of America conference at Aspen Lodge, Estes Park, Colorado, 11-13 November 1994 was a successor to an earlier conference, "Barriers I," held at Wingspread near Racine, Wisconsin, in January 1993, and reported in *Geoscience Canada* (Neale, 1993). Of the 45 earth science (ES) teachers, college and university professors, education administrators, and other activists who were invited, 36 had attended the Wingspread meeting. Representing the Canadian Society of Petroleum Geologists and the Canadian Geoscience (Council's) Education Network, I was the only Canadian present.

The conference was designed to summarize progress made during the past two years in breaking down the barriers to K-16 (kindergarten through college) ES education and to develop strategies for the next decade. Despite the efforts of whirlwind GSA organizers Ed Geary and his colleagues, "Barriers II" lacked the excitement of the Wingspread event because an atmosphere of *deja vu* certainly permeated the group. A possible contributing factor was the altitude of Aspen Lodge (*ca.* 3 000 m), which caused headaches and shortness of breath among some normally articulate people who had flown in from sea-level locations! Nonetheless, much useful information sprouted from both formal and informal discussions and from some of the special presentations. There were certainly lessons to be learned and initiatives that could be