

Mineralogical Society Senior Bursary Report
International discussion meeting on Continental Geology and Tectonics, Xi'an
China, September 2009

In 1993, when I was visiting the fledgling Earth Sciences Department at the University of Hong Kong, it was pointed out to me that China was virtually untouched by modern geological research and there was 'easily 300 PhD's out there, waiting to be done'. Much has changed in the intervening 16 years and now China is becoming a scientific force to be reckoned with, and after much recent investment in geochemical instrumentation is producing a huge volume of high quality geochemical data.

The discussion meeting on 'Continental Geology and Tectonics' was hosted by Northwestern University, Xi'an in China and was a meeting of about 20 senior western scientists and a larger number of Chinese scientists. The principal themes for the meeting and post conference field trips were Precambrian Crustal Evolution and the genesis of Intercontinental Orogenic Belts. For me this was an important meeting inasmuch as it opened my eyes to another Archaean Craton – the North China Craton. The North China Craton is significant in crust evolution models for having allegedly lost its underlying mantle lithosphere sometime during the Mesozoic and is perhaps the prime example of cratonic lithosphere delamination. Now, having visited the area, the geological literature of this important region is more meaningful and more intelligible.

As always there are particular threads which stay with you after meeting like this, usually themes which are current to one's own thinking. In my case it was the reflections of those who work on the subcontinental mantle on the subject of the origin of the continental crust, and (myself included) the reflections of those who work on the continental crust on the origin of the sub-continental mantle. A curious trade-off it might seem. My task was to persuade 'mantle people' that Archaean crust and mantle formed in a coupled manner. The 'mantle people' were telling us that the sub-continental mantle was more extensive and older than we had thought, such that maybe as much as 75% of the continental crust was formed during the Archaean. Implicit in their arguments was also the notion of some coupling between Archaean continental crust and sub-continental lithospheric mantle. Equally interesting is the idea, arising largely from zircon geochronology, that there is a link between the timing of continental growth and the formation of supercontinents.

Modern crustal growth, of course, also sheds light on continent growth through time, and two very significant observations were reported at this meeting. Firstly, that at present we are at a period of stasis in continental growth. Mass balance calculations show that the mass of continental sediment subducted broadly balances the mass of new crust created – not that the two are necessarily identical in composition. Secondly, voluminous juvenile granitoid production in Central Asia during the Phanerozoic appears to have come from an enriched mantle source. This is also likely to be the future style of magmatism around the present Pacific rim, and might represent an underestimated contribution to the average crustal composition. This in turn could explain some of the anomalies in current crust composition mass balance models.

I am grateful to the Society for their support.

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Attached photo

The author (far right) with other members of the post conference field excursion to the Dengfeng area of the North China Craton. (photo Anlin Guo)