The Evolving Continents: Understanding Processes of Continental Growth

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The Evolving Continents: Understanding Processes of Continental Growth

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Preface

This Special Publication of the Geological Society of London, *The Evolving Continents: Understanding Processes of Continental Growth*, is dedicated to the long and spectacular career of Brian F. Windley, a pioneer in the application of uniformitarianism to Precambrian rocks, a leader in linking field geology with the geochemistry and geochronology of different orogenic units with global tectonic history, and an overall polymath who has had a deep influence on many fields of geological sciences.

Brian Windley has not only been a pioneer in science, but has been a mentor and teacher to many geologists who have become leaders in their fields, and in this volume, many of those scientists have contributed chapters that reflect the skill and knowledge that Brian instilled in his students and colleagues.

As an opener for this volume we asked Brian 'what has happened over the years'.

This was his reply.

> Following graduation at Liverpool in 1960, I went to Exeter University to study for a PhD under Ken Coe in an area in the *c.* 1.8 Ga Ketilidian orogenic belt in SW Greenland on a contract with GGU, the Geological Survey of Greenland, after which I was offered a job to undertake a reconnaissance of most of the Archaean craton of West Greenland, six delightful 3–4-month-long summers roaming free with a boat and a huge stack of aerial photographs. But GGU would only enable me to go to Greenland for the rest of my career (gneisses for ever), which I found a limiting thought, and so in 1968 I left and joined Leicester University in England from where the world became my geological backyard. But GGU decided to have its next base-camp in the Fiskenaesset region, where I continued in 1970 and 1972 to study the stratigraphy and structure of the anorthosite complex.
>
> In 1973 I went to southern India to find out how similar the Sittampundi complex was to the Fiskenaesset complex (remarkably so as it turned out). Subramaniam had described eclogites there in 1956, and so I collected some, but did nothing with them until recently when I passed them to Krishnan Sajeev in Bangalore, who found that they are indeed high-temperature eclogites. And we have found similar high-pressure rocks in the Scourian of Scotland and at Rodel in the Outer Hebrides. Interestingly, they all occur in high-grade layered cumulate complexes in which I was so interested in earlier years.
>
> Perhaps surprisingly, I have never done much work in the Scourian of northern Scotland. But in the late 1970s Hugh Rollinson and Jane Sills studied the granulites and layered mafic–ultramafic complexes for their PhDs. And this led to current work with Hugh on the Fiskenaesset chromites.
>
> As a result of a silly paper in *Nature* in 1970 comparing the new Apollo discovery of calcic anorthosites on the Moon with Archaean calcic anorthosites on Earth, I was invited by the great mineralogist Joe Smith to Chicago to make an investigation of the Fiskenaesset anorthositic complex in Greenland with his early, hand-operated ARL microprobe. So I commuted to his lab for 2 months a year for most of the 1970s when, for a week at a time, we alternated with one of us working on the probe in the daytime whilst the other slept, and then took the computer cards to the computer centre during the night.
>
> Although John Dewey had started the revolution into continental plate tectonics in 1969, by the late 1970s I saw that the filtering downwards of such ideas into the Precambrian was being hampered by a general lack of knowledge amongst the Precambrian community of modern collision tectonics, and so I started in 1980 a five-year project in the Himalayas of Pakistan with lots of students and staff such as Qasim Jan (mineralogy), Mike Coward (structure), Mike Petterson (Kohistan arc), Asif Khan (Chilas complex), Carol Pudsey (sedimentology) and Lewis Owen (terraces of the river Indus). To tackle the high mountains, glaciers and moraines of the Karakoram range in the next 5 years, two young mountaineering post-doc fellows, Mike Searle and Tony Rex, joined the team. With their mountaineering colleagues they organized the porters to carry the food in (and the rocks out) in the two-week stroll up the Baltoro River and glacier to the base of K2.
>
> After our horrific jeep accident above Skardu in 1981 with Mike Coward, Asif and Carol, I left the Himalayan–Karakoram scene and moved northwards into China to the North China craton with Jane Sills and Zhai Mingguo and then westwards to the Tien Shan range in Xinjiang with Mark Allen and Zhang Chi, and to the Chinese Altai with Guo Jinghui (with a second horrific jeep accident). The attraction of continuing a crustal section northwards led to more than a decade of summers in the Central Asian orogenic belt of Mongolia, but first the Cenozoic uplift had to be resolved with Dickson Cunningham starting in 1994; why were 4000 m mountains going up in the middle of Asia? I had met Dickson in Tierra del Fuego before Ian Dalziel's memorable and excellent GSA field trip to Antarctica in 1990. After much work in Mongolia especially with G. Badarch and Alfred Kröner (and more recently in Kyrgyzstan with Alfred and Dmitry Alexeiev), and after being nearly drowned in a river in Mongolia, I moved south to work with Xiao Wenjiao from Beijing on accretionary belts in the Qilian Shan (Shan means mountains in Chinese), the Kun Lun, Nei Mongol, and the Tien Shan, and currently in the Bei Shan. Currently, it is a pleasure to work with Lui Dunyi and Jian Ping from the SHRIMP laboratory in Beijing on zircon-related studies of ophiolites and associated rocks in China and Mongolia, and with Reimar Seltmann from CERCAM (Centre for Russian and EurAsian Mineral Studies, which belongs to the Natural History Museum, London) on granites and mineral deposits in Central Asia.

Going back a bit, a lifetime's interest in sapphirine-bearing rocks began in the mid-1960s when I came across Giesecke's 1809 type locality in Fiskenaesset harbour, after which Richard Herd came to Imperial College and Leicester, and joined the GGU team in 1970–1972 in the Fiskenaesset region to tackle all the minerals that the field geologists could hardly recognize. Then in the mid-1970s I found I was sitting in Chicago at a desk opposite Dietrich Ackermand from Kiel in Germany who was also visiting Joe Smith. So began a decade of sapphirine studies in 1982 with a NATO grant with Richard and Dietrich. This led to the first visit to Madagascar in 1986 with Dietrich to hunt for Lacroix's 1922–1923 report of sapphirine with anorthosite (sakenite); we never made it as we got badly stuck in a mosquito-infested Shagashak River on the plains of Horombe. But it was the interest in sapphirine that led to a study of the tectonics of Madagascar with Theodore Razakamanana, Alan Collins as a post-doc, and Alfred Kröner on zircon studies. And that was how Alfred came later to join the Mongolian project. Following a summer in 2006 with Richard Herd showing True North Gems how to find more rubies in sapphirine rocks throughout the Fiskenaesset region, my latest joy has been the opportunity to return to West Greenland in 2008 and 2009 with GEUS (the Geological Survey of Denmark and Greenland) in their re-evaluation of much of the Archaean craton.

Because the Pan-African Malagasy orogen extends northwards into Yemen it was natural to work with Martin Whitehouse and Mahfood Ba-bttat on the equivalent geology in Yemen in the early 1990s, which was great until our kidnap. Later, Martin, Vicky Pease and I continued across strike in Dhofur, Oman.

After so many years looking at the Central Asian orogenic belt in Mongolia, I thought I knew as much as anyone about how to interpret an old accretionary orogen. But after a year's visit to Shigenori Maruyama in Tokyo in 2001–2002 (one of the most stimulating years of my life) I realized that I knew very little indeed. We agreed that there was a poor understanding worldwide amongst the Precambrian community of the geology of Japan, arguably the best modern analogue for accretionary orogens back to Archaean greenstone belts. So, after much discussion, that led to the current ERAS project (Earth Accretionary Systems in Space and Time) of the International Lithosphere Programme led by Peter Cawood and Alfred Kröner. I had been taking students to Anglesey in North Wales for many years, but it was not until 2001 that I realized that the *c.* 600 Ma Mona Complex is remarkably similar to the Mesozoic–Cenozoic accretionary orogen in Japan, and so Shige and I started a project with several Japanese staff and students, in particular Takahiro Kawai, to unravel the geology of Anglesey and Lleyn.

On arrival in Leicester in 1968, I started an undergraduate course on Earth Evolution which was essentially on continental plate tectonics through time, but found that there was no suitable textbook on that subject, and so I came to write in my spare time *The Evolving Continents*. Because I learnt so much that was useful for my research, there was little to hold me back writing more editions and updates.

In looking back, I feel it might have been better to do things in reverse order, and not start with some of the oldest rocks in the deep crust, and evolve into neotectonics in Mongolia and modern accretion in Japan. And what of the future? My only regret is that there is not enough time.

And finally, thanks to Judith for all that driving and for everything else.

Brian Windley, 30 June 2009

We hope you enjoy and benefit from this volume, as much as we have benefited from working with Brian over the years.

TIM KUSKY
MINGGUO ZHAI
WENJIAO XIAO

Brian Windley at Stornoway, Outer Hebrides, Scotland, 2009.