

Unknown Bolivia

Overseas exploration against the odds

by Martin Litherland, *Keyworth*



Martin Litherland, BGS © NERC

The green tunnel, the geologist's world for days or weeks on end.

Between 1976 and 1983 a team of ten BGS geologists and their Bolivian counterparts undertook the reconnaissance mapping of the Bolivian Precambrian shield under the sponsorship of the Overseas Development Administration (UK) and the Bolivian Government. The project was the biggest ever undertaken by the BGS Overseas Division in terms of team numbers, costs and field area — approximately the size of Great Britain. It tested the mettle of everyone involved.

The field area

In 1976 the shield of eastern Bolivia was an enormous, unexplored and essentially uninhabited stretch of Amazonian forest, conforming to a laterite plain with some rocky inselbergs; satellite imagery was little or no use for mapping it. The area was (correctly) assumed to be the western extension of the great Brazilian Precambrian Shield. It was the country of Colonel Fawcett's wanderings and the source of the legendary Lost World.

The team was based in Santa Cruz de la Sierra, the jungle city of the Bolivian lowlands. The first three years were spent in the south of the area where there were a few dry season, four-wheel drive trails linking forgotten towns which flourished under the Jesuit Empire (1692-1767). The final years were spent in the north where rivers took the place of trails and field brigades and canoes were flown in using the only available DC-3 in town

or Bolivian Airforce helicopters. There were no topographic maps for the north of the area; geologists had to make their own. They named topographic features, if only for use in geological nomenclature.

With no local money to train line-cutters, the field brigades had to recruit and follow local *macheteros* through the jungle. The bulk of the southern area lies on the Amazon/Plate watershed with no surface water in the dry season — the field season. The accompanying semi-deciduous trees allow sunlight to

penetrate the forest and promote a thick secondary bush; thus leaving the nightmare paradox of impenetrable bush and no surface water.

There was an abundant fauna, and plenty for the pot. The problem was God's little creatures and their daily persecution routine — the mosquitos, gnats, ticks and little ticks (*garapatillas*); the hornets and local sweat bees that covered exposed flesh and entered the ears; and, above all, the African, or 'killer' bees that kept one dancing from dawn to dusk.



Chris Wardle, BGS © NERC

A map of the project area in the idiosyncratic style of Exploration Fawcett.

Politics

Between 1976 and 1982 Bolivia was under a succession of military governments which brought about the ruin of the economy and the collapse of the local currency. To mention that Klaus Barbie was involved with one of them will give the political flavour of the times. Local geologists, a legal necessity in a field brigade, could not support their families and left the project; field mobilisations involving fixed wing and helicopter flights were postponed; and military coups brought about administrative chaos. In 1982, during the Falklands War, fieldwork continued despite the hysteria directed at the British families in Santa Cruz. Smuggling, including valuable hardwood, and cocaine manufacture in the jungle, continued throughout the time of the project.

Achievements

The geology of the shield was found to comprise Middle Proterozoic gneisses, schists and granulites, cut by orogenic granites; all overlain by a supracrustal sequence, itself deformed and intruded. These events, deciphered by field relationships and Fiona Darbyshire's geochronology — the first female BGS geologist on overseas fieldwork — conform to Grenvillian activity; recent publications now place the Bolivian shield alongside the Canadian type area prior to the break-up of the Rodinia supercontinent at around 700 Ga.

Fourteen sheets at 1:250 000 scale were published for the area along with comprehensive sheet reports. At the 1:100 000



Geological maps are now available for an area previously coloured entirely red.



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The long and the short of it — the BGS residential team in early 1977, fluent in Spanish and ready to go! Long legs may be better for negotiating fallen trees but the macheteros are small and cut lines to fit the likes of Barry! (Left to right) Barry Webb, Richard Annells, Martin Litherland, Ian Mitchell, Don Appleton, Jevan Berrangé (visiting photogeologist and later Team Leader 1979-83), Chris Fletcher, Eugene O'Connor, Ben Klinck, Keith Bloomfield (Team Leader 1976-79) and Peter Pitfield. Mike Hawkins, George Power and Chris Burton replaced Webb, Mitchell and Fletcher in 1979. A three-man team continued the work from 1983 to 1986.



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The Arco Iris Falls, discovered by the Project, marks the exit of the Rio Paucerna from the tableland of Serrania Huanchaca, itself discovered by Colonel Fawcett whose descriptions to Arthur Conan Doyle inspired the novel The Lost World. Project teams spent three-month spells over this area which is the size of Devon and stands high above the forest.

scale, three special sheets were published and there are unpublished maps and reports for the south of the area at this scale. An Overseas Memoir and Geochemical Atlas were produced for the entire area with 1:1 million scale published maps.

The main thrust of the project was mineral and geochemical exploration accompanied by a good geological database. Various discoveries were made including gold and tin in the schist belts; copper and nickel in an enormous layered mafic/ultramafic complex; and

rare earth elements (REEs) in Mesozoic alkaline igneous rocks. In recent years, under democratic governments, mining companies have examined the schist belts in more detail and at present there are two modern (gold) mines in operation and many other prospects under evaluation. New roads and infrastructures are in place and the local people are seeing signs of prosperity for the first time since the expulsion of the Jesuits. The BGS geologists have moved on; they are an unsung, but a fairly satisfied lot.



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Not piraña for tea again!