Newsletter of the Volcanology and Igneous Petrology Division
Geological Association of Canada

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From the President

Welcome to the newest edition of Ashfall! We hope you have been having a wonderful fall and are gearing up for the holiday season.

One of the main activities of the VIP division is to recognize outstanding student performance by awarding the Gelinas medals for the best PhD, MSc and BSc theses. The awards increase interest in volcanology and igneous petrology and encourage students to pursue and achieve excellence in research. In the last several years, the submitted theses have demonstrated a wide breadth of student research ranging from experimental investigations to physical volcanology, natural hazard studies, geochemical and petrogenetic studies and the application of igneous petrology and volcanology to mineral exploration and mineral deposits. Thus, as the new year approaches, the division is seeking nominations for these awards. Please keep your eyes open for theses which may be deserving contenders for these awards. Likewise, we need nominations for the Career Achievement Award. You may have noticed that past recipients have also included, among others, researchers in the prime of their professional careers.

The division will also be seeking a new slate of officers at the next GAC/MAC meeting, to replace officers whose terms are expiring. If you are interested, please do not hesitate to contact me (jdostal@smu.ca) for further information. The new officers will be elected at the GAC/MAC meeting in May 2012 in St. John's.

I would also like to thank Glyn Williams-Jones for keeping our website updated and in excellent shape (www.vip-gac.ca) and Pete Hollings for editing and publishing Ashfall. As this is the last edition of Ashfall of 2011, I would like to take this opportunity to wish you a wonderful holiday season and a great 2012.

Jarda Dostal

From the Editor

It's amazing what you can find when you type 'Christmas' and 'volcano' into google. The image above is from pre-wallpapers.com and seemed appropriate given the time of year. We have two great articles in this edition of Ashfall, offering an account of a trip to the Newer Volcanic Province of South Australia and a discussion of somewhat older volcanism in Kashmir.

Merry Christmas - Pete

Volcanology fieldtrip report - 9-13 July 2011

By Pierre-Simon Ross, INRS-ETE

"Factors that influence varying eruption styles (from magmatic to phreatomagmatic) in intraplate continental basaltic volcanic provinces: the Newer Volcanics Province of southeastern Australia"

Leaders Cas, Blaikie, Boyce, Hayman, Jordan, Piganis, Prata, van Otterloo (Monash University, Melbourne)

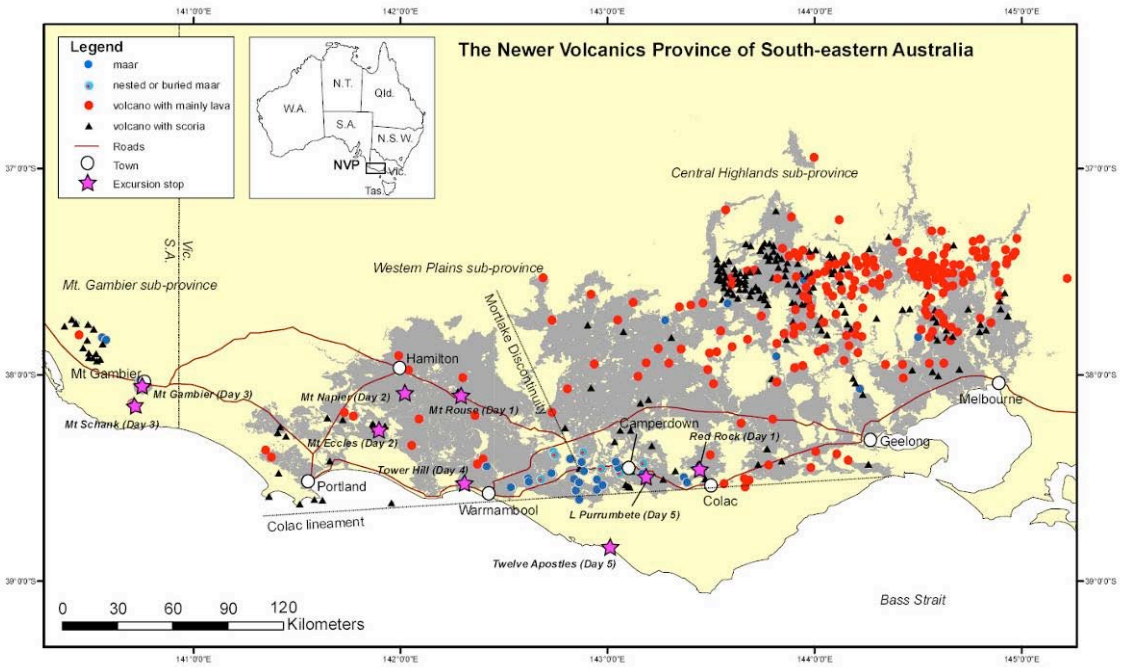
This well organised five day trip to the Newer Volcanics Province (NVP) of Victoria and South Australia was offered as part of the IUGG 2011 conference in Melbourne. The NVP is a 27 000 km^2 monogenetic volcanic field in which the oldest rocks are 4.6 Ma and the youngest volcano (Mt Gambier) is about 5000 years old. Melbourne, the second largest city in Australia, lies on the eastern edge of this still-active volcanic field!

Most of the surface of the NVP is occupied by mafic lavas plains (in grey on the figure above). A large number of monogenetic volcanoes are known, including small lava shields, scoria cones, maars, and "complexes". The complexes are multi-vent monogenetic volcanoes which often display products formed by a range of eruptive styles, from magmatic to phreatomagmatic. The major goal of the fieldtrip was to discuss the factors that influence the eruptive styles of small mafic eruptions.

The geological highlights of the trip, in my opinion, were the Mount Gambier Volcanic Complex, Mount Shank, the Tower Hill Volcanic Centre, and Purrumbete Maar. I will briefly describe some aspects of the last two volcanoes in order to encourage Ashfall readers to see the NVP for themselves.

Purrumbete Maar consists of a 2.5 to 3.0 km-wide, nearly circular crater, filled by a 45 m-deep lake and surrounded by a 5 to 40 m-thick tephra rim. The proximal part of the tephra rim, which dips very gently outwards, is particularly well exposed on the eastern side, in a quarry cut in a radial orientation relative to the crater (i.e. parallel to the transport direction of pyroclastic density currents). This quarry displays superb climbing dunes, with the current direction from right to left in the photos.

General view of the quarry and Lake Purrumbete. Photo courtesy P.-S. Ross



Map of the Newer Volcanics Province. Figure from the Field trip Guidebook

Details of the phreatomagmatic deposits at Purrumbete. Photo courtesy P.-S. Ross

There are many other great features to see at Purrumbete Maar (bomb sags, accretionary lapilli, etc.). Although this is the volcano we visited last due to itinerary constraints, it was one the simplest ones, being dominated by phreatomagmatic eruption products.

The **Tower Hill Volcanic Centre** (~35 k.a.) is a 3 km-wide crater consisting of up to four coalesced maars, with up to eight scoria cones in the middle. The scoria cones emerge from the lake.

Overview of the Tower Hill Volcanic Centre. Photo: http://136.154.202.60/mineralogy/images/html/volcan3.html

In most maar-scoria cone complexes I have seen, the maars formed first and then the scoria cones (or sometimes spatter accumulations), reflecting a sudden drying up of the eruptive style with time. The story is much more complicated at Tower Hill, as visualized notably in the spectacular "CRB quarry". There, the pyroclastic succession shows alternating black, grey and cream layers, representing the deposits of magmatic (scoria fall), "transitional" and phreatomagmatic (base surge) styles of activity, respectively. It is not clear whether (1) the scoria fall layers were sourced from an early scoria cone, active at the same time as a phreatomagmatic vent, or (2) only one vent was involved in creating the exposed succession, but its eruptive style changed cyclically due to variations in magma flux, aquifer recharge, etc. There was lively debate about this and many other questions during the fieldtrip.

Overview of the CRB quarry at Tower Hill. Photo courtesy P.-S. Ross

Detail of an abrupt contact – under the pencil – between grey-coloured "transitional" deposits and cream-coloured wet phreatomagmatic deposits. Photo courtesy P.-S. Ross

Along the way we also had a chance to sample the local cuisine and beverages, as well as to spot a few koalas, wallabies and emus in the wild. Lava caves and coastal scenery along the Great Ocean Road were also included. Participants were asked by leader R. Cas to supply the entertainment for the fieldtrip dinner on the last evening, and they responded enthusiastically. This included a short musical performance from the obscure Canadian band "Phreato and the Magmatics", and a poorly rehearsed theatrical re-enactment of the Holocene eruption of Mt Shank by the entire group of participants.

A look into Permian volcanism: exploring the Panjal Traps of Kashmir

J. Gregory Shellnutt

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The Himalaya Mountain range is the highest in the world and stretches from Pakistan and Afghanistan in the west across India, Tibet, Nepal, Bhutan and east into Sichuan Province of China. It is perhaps the most spectacular mountain range in the world and one that eloquently demonstrates the processes of collisional tectonics (e.g., the top of Mount Everest is composed of limestone). I first saw the Himalaya while working in western Sichuan while collecting samples on top of a more modest mountain (~2000 m in elevation). Looking west, my colleagues and I saw the snowcapped peaks of the eastern most part of Tibet and since that moment I always wondered, figuratively speaking, what was over that next mountain range and it turned out to be Kashmir.

Kashmir has one of the best, if not the best, exposures of Permian rocks in the world. The sedimentary section at Guryal Ravine (Fig. 1) to the southeast of Srinagar was in contention to be the global stratotype section and point (GSSP) for the Permo-Triassic boundary however given the political disposition of the region the type section is in Zhejiang, China (Yin et al., 2001). The Permian (299 Ma to 251 Ma) is a rather short period of geological time and yet at least three major geological events occurred. It was the last period when all major continental blocks were united, there were two periods, one at ~260 Ma and the other at ~251 Ma, where life struggle to survive from collapsing ecosystems and the largest eruption of continental flood basalts occurred (i.e., Siberian Traps). In fact the end-Permian mass extinction was the largest the Earth witnessed when ~90% of all marine and 70% of all terrestrial species died out. However, unlike the well-known Cretaceous-Tertiary mass extinction, the end-Permian mass extinction does not have a 'poster-boy' species which captivates the imagination of society like the Tyrannosaurids. I think it would be rather odd, perhaps even humorous to watch 'Permian Park' where the protagonists are running from anaspids (herbivorous/insectivorous lizard- and turtle-like creatures) and surviving on what could be a sea-food lover's dream of trilobites, ammonites, brachiopods and crinoids. All humor aside, despite the significance of the end-Permian mass extinction it remains poorly understood and as a consequence is one of the great research topics of all branches of geosciences (White, 2002). It is with that in mind that colleagues and I decided to investigate this fascinating period in Earth's history.

My particular interest in the Permian is that there was

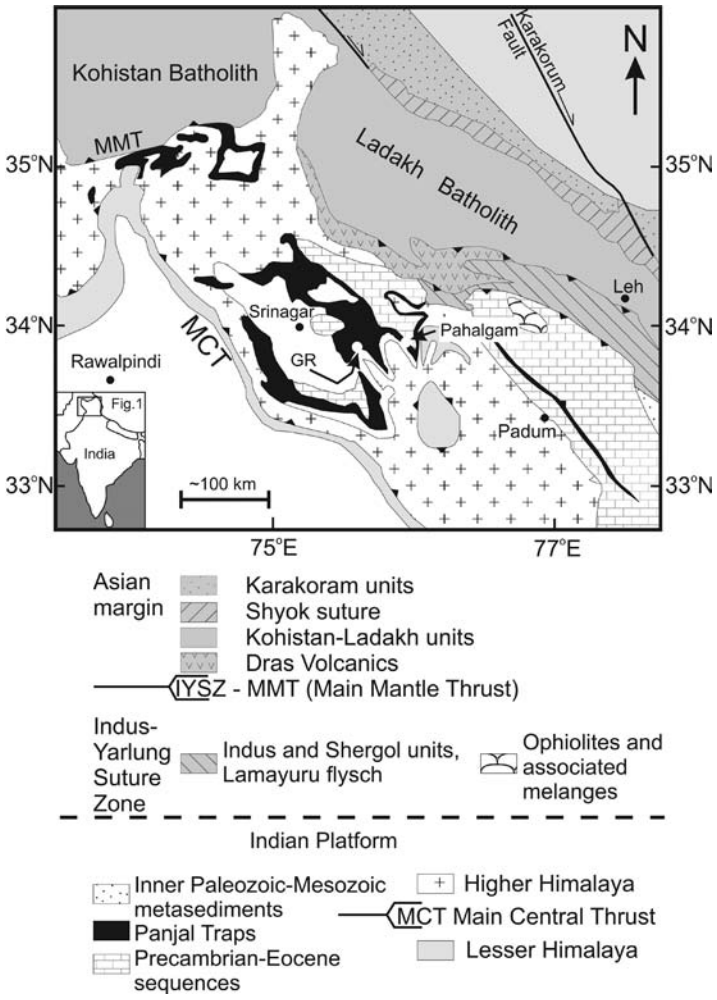

Figure 1. Location map of the Panjal Traps in northern India and Pakistan (modified from Chauvet et al., 2008). Samples collected from Guryal Ravine (GR) and Pahalgam.

an unusually large amount of continental magmatism during this time, for example the flood basalts and magmatic rocks of Siberia, China, Mongolia, India and NW Europe. Furthermore, Rampino and Stothers (1988) were amongst the first to suggest that there may be a connection between flood basalt eruptions and mass extinctions. Although the ages of many large igneous provinces are known, the connection between all of the Permian magmatic provinces and the two mass extinctions are yet to be completely resolved. Given the large amount of work compiled on the Siberian Traps, Emeishan large igneous province and Tarim flood basalts (Xinjiang, China) the only flood basalt province which has not been extensively studied is the Panjal Traps of Kashmir.

One of the most contested correlations of the Permian is the Panjal Traps, due to the conflicting geological relationships and the fact there is no radiometric age available. Initially they were thought to have erupted before the deposition of the Gangamopteris beds (containing Gangamopteris kasmirensis) constraining their emplacement to Late Carboniferous, however, in some localities the traps were underlain by the Gangamopteris beds (Nakazawa and Kapoor,

1973; Nakazawa et al., 1975; Pareek, 1976). Nakazawa et al. (1975) and Wopfner and Jin (2009) both suggested that Panjal Traps are constrained to the Early-Middle Permian (Sakmarian-Artinskian) however, several authors interpret the Panjal Traps to be Middle to Late Permian and argue that they likely contributed to the mid-Capitanian mass extinction at ~260 Ma (White and Saunders, 2005; Chauvet et al., 2008). Complicating the matter further, Veevers and Tewari (1995) suggest the eruption of the Panjal Traps was related to Late Permian (~250 Ma) magmatism along the Gondwana margin after the opening of the Neo-Tethys, whereas Zhu et al. (2010) suggest they were part of a larger volcanic belt which includes the Bhote Kosi basalts and Abor volcanic rocks of India and the Jilong Formation and Selong Group basalts of Tibet and related to the Early Permian rifting of the Neo-Tethys.

Recently, the political and social unrest which typified life in Kashmir since the partition of British India has eased and tensions between Kashmiris and the Indian military and police forces are subsiding, although there are still clashes from time to time. The increased tourist trade has brought much needed investment and stability to the region and it is within this background that we were able to visit Kashmir with the assistance of colleagues from University of Jammu and the Jammu and Kashmir State Geology and Mining Department. We were able to collect samples from Guryal Ravine across the Permo-Triassic section and collect flood basalts at localities throughout the southern Kashmir Valley with the cooperation of local communities (Fig.1).

Our geochemical work on the Permo-Triassic section at Guryal Ravine is ongoing as we have completed C-isotopic analyses and will be starting the Mo-isotopic, trace element and PGE analyses by the end of the year. In contrast, the work on the Panjal Traps is nearly completed and the preliminary results were presented at the Asia-Oceania Geoscience Society Annual meeting held in Taipei during August of this year. Our results have provided new insights into the origin of the Panjal Traps and their association, or lack thereof, to the ~260 Ma mass extinction. We were able to date zircons separated from the felsic volcanic rocks of the Panjal Traps which yielded a mean $^{206}Pb/^{238}U$ age of 289 ± 3 Ma (Shellnutt et al., 2011). The age has significant geodynamic implications including: 1) The Panjal Traps are contemporaneous with Carboniferous-Permian granitoids of the Himalaya, 2) The Panjal Traps cannot be related to the Late Permian (~250 Ma) post Neo-Tethys rifting of Gondwana and are likely related to the initial opening of the Neo-Tethys Ocean during the Early Permian (Fig. 2) and 3) The Panjal Traps are not Middle-Late Permian and therefore could not be a factor in the mid-Capitanian or end-Permian mass extinctions. The third conclusion is important because it suggests that flood basalt eruptions may not directly cause ecosystem collapse but rather other mechanisms (e.g., country rock degassing, bolide impact)

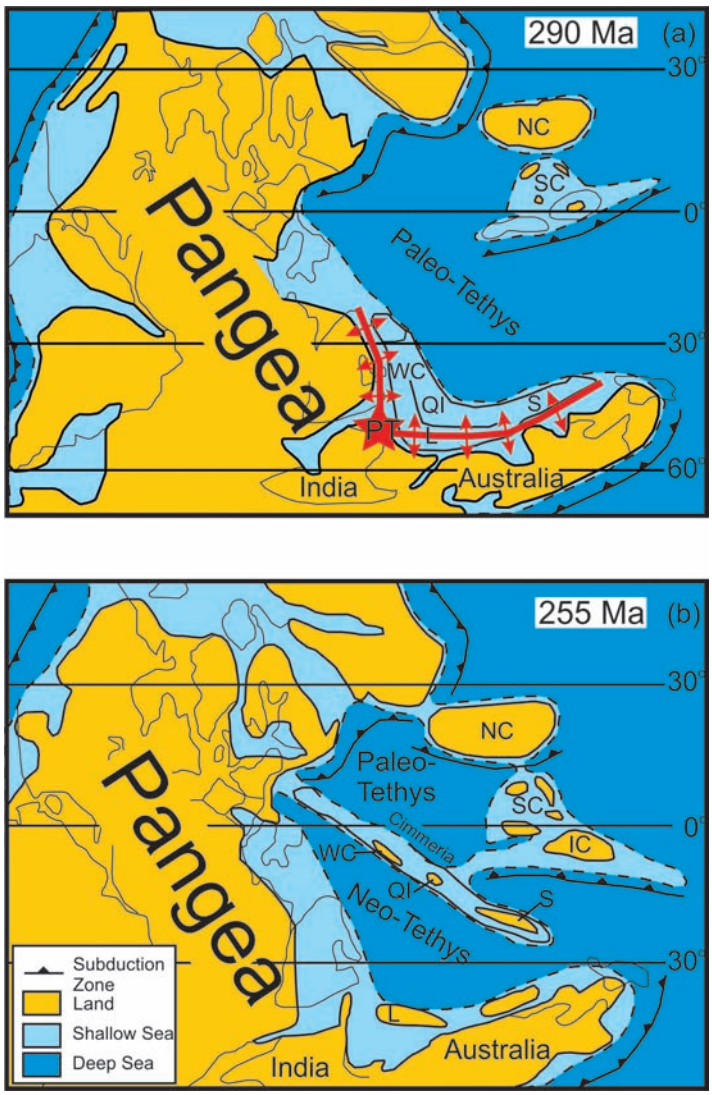

Figure 2. Paleogeographic reconstructions of Pangaea. (a) ~290 million years showing the location of the Panjal Traps (PT) and possible rift propagation (red) and (b) after the rifting of Cimmeria from the northern margin of Gondwana (modified from Metcalfe, 2006). North China (NC), South China (SC), Indo-China (IC), western Cimmeria (WC), Lhasa terrane (L), Qiangtang terrane (QI), Sibumasu (S).

are needed.

New projects in Kashmir will begin in the coming years to fully understand the extent, duration of magmatism and economic potential of the Panjal Traps in Kashmir. The new results will help to understand the significance of Permian magmatism during the formation of Pangaea and their association with the two mass extinctions. Although there is still social and political unrest in the region, it seems the days of violent recourse are diminishing and the geological information contained within the Permian rocks of Kashmir are once again being opened to the world.

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Meeting Announcements

ST. JOHN'S 2012 www.stjohns2012.ca
GEOSCIENCE AT THE EDGE · GÉOSCIENCES DE POINTE
GAC®-MAC JOINT ANNUAL MEETING · AGC®-AMC CONGRÈS ANNUEL CONJOINT | MAY 27-29 MAI, 2012

The 2012 GAC/MAC meeting will take place at the University of Ottawa in conjunction with the Society of Economic Geologists and the Society for Geology Applied to Mineral Deposits from May 27th to 29th, 2012. The deadline for submitting abstracts is January 27, 2012. Visit the meeting website for details.

Institute on Lake Superior Geology

Institute on Lake Superior Geology
www.lakesuperiorgeology.org

The 58th Annual meeting of the ILSG will be held in AThunder Bay, Ontario from May 17 &, 2012 with field trips both before and after. Visit the ILSG website for more details.

VIP reminders

The deadlines for the various VIP awards are fast approaching so bear them in mind if you are thinking of nominating anyone.

The **Career Acheivement Award** - the deadline is ***31 January 2012*** and nominations should be sent to Jarda (jarda.dostal@stmarys.ca)

The **Gold Gelinas medal** for an outstaning PhD thesis in the fields of volcanology and igneous petrology - the deadline is ***28 February 2012*** and nominations should be sent to Jarda (jarda.dostal@stmarys.ca)

The **Silver Gelinas medal** for an outstaning MSc thesis in the fields of volcanology and igneous petrology - the deadline is ***28 February 2012*** and nominations should be sent to Pete (peter.hollings@lakeheadu.ca)

The **Bronze Gelinas medal** for an outstaning Honours thesis in the fields of volcanology and igneous petrology - the deadline is ***15 April 2012*** and nominations should be sent to Michelle (mdewolfe@mtroyal.ca)