THE VICTORIAN GEOLOGIST

October 2011

THE GEOLOGICAL SOCIETY OF AUSTRALIA
Victoria Division

Next General Meeting

Thursday 27th October at 6:15 p.m.

The Emplacement of Granite

Prof. Sandy Cruden
School of Geosciences, Monash University

Fritz-Loewe Theatre, School of Earth Sciences, The University of Melbourne
Preceeded at 5:30 p.m. by drinks and nibbles in the tea room, 4th floor. Cost $2

Geologists have debated the formation of granite vigorously since the mid 18th century when academic battles raged between Plutonists and Neptunists. This discussion continued until the early to mid 20th century when the focus of the debate centred on whether or not granite formed in situ by granitization or by ascent and emplacement of magma. In that last 50 years, with the acceptance of the magmatic origin of granite, attention has been focused on the physics and chemistry of melting and melt migration in the deep crust, how magmas are transported vertically and how space is made for them at the final level of emplacement. In this talk I will give a biased overview of the latter two physical aspects of granite magmatism, based on 25 years of field, geophysics and geochronology-based studies of granite intrusions in Scandinavia, North and South America. The vast majority of plutons have tabular to wedge shapes and their thickness rarely exceeds 3 km. Like dykes, sills, laccoliths and layered mafic intrusions, plutons are characterised by an empirical power law scaling relationship between thickness (T) and length (L). All classes of these tabular intrusions have different power law slopes and intercept values on log T vs. log L plots, which reflect the operation of different emplacement mechanisms at different crustal depths. It is argued that felsic magmas ascend rapidly by channelized processes and that the space for most granitic intrusions is made by depression of their floors in the context of an exchange of mass and heat between the lower crust and mid to upper crust. It is physically possible to grow large felsic intrusions continuously over short periods of geological time (<<100 Kyr) but a growing body of precise U-Pb, single zircon geochronology and field observation indicates that plutons are constructed by short-duration magma pulses that operate periodically on the 1 to 3 Myr timescale. Not surprisingly, the rates, timescales and volumes of felsic plutonic processes are comparable to those of modern and ancient volcanoes.

A Message From the GSAV Chair

Dear Victorian Division Members.

The GSA has recently polled members on whether or not they believe the Society should have a position statement on climate change. The outcome of that poll was a strong majority vote that the Society has a position. The poll resulted in a large range of views expressed by members that could act as a starting point for discussions within divisions about what position the Society should take on the climate change issue. At this point we are inviting members to express their views and to initiate a discussion on what position the society should take. For those members that are interested a document with the consolidated views expressed by respondents to the poll is available from the divisional secretary. In the first instance we would be happy to accept views from members about what the Society position should be and discuss them at the last Thursday of the month meeting. The GSA executive are interested in statements about what the statement should and should not contain. As this is an emotive issue for many members we need to be constructive in developing the Victorian division view of the issue.

Regards

David Cantrill

Award News

This month sees the awarding of two GSAV student awards; the D.E. Thomas Medal and the Frank Canavan Award. The D.E Thomas medal commemorates David Evan Thomas, the well known former head of the Victorian Geological Survey who was famous for his detailed and precise mapping.

The medal is awarded to the best honours mapping thesis produced at a Victorian university. This year two awards have been awarded due to the exceptional quality of both theses. This year's recipients are Marcus Thompson (University of Melbourne) and Melanie Finch (Monash University).

The Frank Canavan Award was set up in 1996 by Mrs Canavan in honour of her late husband Frank, a well known Victorian geologist who was very active in promoting geological education and was a member of the Education Subcommittee of the Division.

The Award is a cash sum for the purchase of geological textbooks, and is awarded to the most promising student who has finished second year geology at a Victorian university, as judged by the student's academic performance. This year's recipient is Sinead Ellen Gough from Monash University.

Congratulations to all of our award winners and keep up the fantastic work.

The GSAV Thanks...

The GSAV committee would like to extend a big thank you to Erin Matchan for her help in organising pre-seminar drinks for the GSAV monthly meetings for the past few years. Erin is nearing the end of her PhD and we wish her well in the future.

Helen Green, another Melbourne University PhD student will take over the role of providing pre-seminar refreshments.

Conference Report

GSAV Student Scholarship Recipient
Amy Cockerton
Masters Student, School of Geosciences, Monash University

The Goldschmidt Conference is the biggest geochemical conference in the world. This year, over 3200 delegates travelled to Prague, from 57 different countries. Having travelled from Melbourne to the other side of the world, I wanted to make sure that I made the most of the experience. This meant (of course) signing up for every social event and sightseeing activity possible. The Czech volunteers were amazing, very friendly and worked full time to ensure the smooth running of the conference.

I arrived two days early, and had time to join in tours of the Old Town and Prague Castle, which were both amazing and made me very jealous of European culture. After the Welcome Drinks on the first day, it was time to settle down into the serious side of things. And boy did it get serious! On the first day I saw my first, fairly intense, scientific argument between two authors, both of whom seemed to concede no ground and one of whom seemed to be presenting a cyclic argument. Goldschmidt had many symposia and talks covered topics from "Nitrogen Isotopes and Nitrogen Recycling in Terrestrial and Aquatic Systems", to "From Planetesimals to Planets" and "Dating of Minerals Deposits and Fluid Flow in the Lithosphere".

Two days in and feeling slightly overwhelmed by the body of scientific knowledge around me, it was time for me to present. This being the first conference I have ever attended, it is safe to say that I was extremely nervous the night before my talk. But despite the disaster I had prophesised; things seemed to go pretty well. My presentation called "Gold scavenging by Liquid Bismuth Melts" was on my recently submitted paper about the "Liquid Bismuth Collector Model", a hypothesis which had previously been proposed by Naomi Douglas and colleagues at ANU at the Australian Geological Convention in 2000.

The reasoning behind this model is this: (1) native bismuth has a very low melting temperature of 271°C and (2) bismuth and gold have a close thermodynamic relationship as shown through numerical and experimental modelling. Thus, a bismuth-saturated hydrothermal fluid, at temperatures exceeding 271°C, will precipitate bismuth from the fluid not as a solid, but as a melt. This melt can interact with dissolved ionic gold in the fluid and scavenge it from the system, enriching the liquid bismuth with (now) liquid gold. My studies test this hypothesis at the Stormont Bi-Au skarn prospect in northern Tasmania. The spatial relationships, textures and mineralogy were observed as well as conducting bismuth inclusion annealing experiments which further corroborated my interpretations.

The talk was well received, although due to the size and speed of the conference, I did not receive as many questions as I had hoped for. I met many interesting geologists and geochemists at the conference and now have new friends at ANU, Brown University and Imperial College. I would like to thank the GSAV for helping me with this opportunity. The experience was invaluable to me and it is fantastic that these opportunities exist for Victorian Students!

The Vltava River viewed from Charles Bridge, with Prague Castle in the distance.
Photo Credit. A. Cockerton

Paper Reduction Effort

Attention All Members!!!

Are you still receiving a hard copy of TVG each and every month? Each month a significant number of hard-copy TVG's are printed but wouldn't it be great if we could reduce that number, lessening costs and our impact on the environment? Well the good news is you can by switching to receiving an electronic copy of TVG via email.

It's as simple as going to www.gsa.org.au, logging in with your member number and password, and changing your preferred newsletter delivery method to electronic. Alternatively, you can email info@gsa.org.au or call 02 9290 2194 to change your preference.

'Snowball Earth' hypothesis challenged

ScienceDaily, Oct. 12, 2011

The hypothesis that Earth was completely covered in ice 635 million years ago has received a serious blow. The atmospheric concentration of carbon dioxide during that period was much lower than previously thought, according to a team of French researchers from the Institut de Physique du Globe de Paris (CNRS/IPGP/Université Paris Diderot), working in collaboration with scientists from Brazil and the U.S.

Their work, published in the journal *Nature*, challenges part of the so-called 'Snowball Earth' hypothesis and rekindles the debate about the origins of the deglaciation mechanism.

Outcrop in the Terconi quarry, Mato Grosso, Brazil. The lower part shows a pink dolomite layer overlain by grey limestone, richer in organic matter. These carbonates lie directly above Marinoan glacial sediments. (Credit: © Pierre Sansjofre)

Earth has experienced several extreme glacial events, two of which took place during the aptly named Cryogenian period (710-630 million years ago). In 1992 and 1998 scientists hypothesized that around 635 million years ago our planet underwent a major glacial episode that left it entirely smothered in ice. Today still, the question of how this episode came to an end remains unanswered, given that ice reflects more solar radiation back into space than rocks do. In the Snowball Earth hypothesis, it is assumed that enough CO_2 of volcanic origin had built up in the atmosphere for this greenhouse gas to warm up the surface of the planet and cause the ice to melt. According to this scenario, CO_2 concentrations must have fluctuated around 120,000 ppmv (parts per million by volume) -- i.e.,12%, which is 300 times greater than CO_2 concentrations today.

In order to assess the atmospheric concentration of CO_2 at that time, the French, Brazilian and US researchers studied carbonates deposited 635 million years ago (the Marinoan glaciation). These sediments cap the glacial deposits of that period, believed to have witnessed a global glaciation known as Snowball Earth. The study is based on the difference in carbon isotopic composition between carbonates and organic matter in fossilized organisms, which reflects atmospheric concentrations of CO_2. The results show that CO_2 concentrations were very close to what they are today (less than 3,200 ppmv), which is far from being sufficient to bring about the end of a glacial episode of this magnitude.

This work not only challenges part of the Snowball Earth hypothesis, but also implies that these glacial episodes were not as intense as previously suggested. Moreover, this data is consistent with the idea that the atmosphere at the same period was much more oxygen-poor, around 1%, as compared to today's levels of approximately 20%. Scientists will therefore need to examine alternative deglaciation mechanisms or gases other than CO_2, such as methane, which has also been suggested as part of this hypothesis.

Student Funding Opportunities

Geological Society of Australia (Victoria Division) Student Research Scholarships

The GSAV are pleased to offer up to $10,000 per year in scholarships available to honours and postgraduate students for assistance with travel costs associated with conferences and field work.

The scholarship is valued at up to $500 for travel within Australia and $700 for travel outside of Australia. The number of and value of the scholarships awarded each year is made at the discretion of the GSA(Vic) committee.

Funding will not be granted retrospectively and applicants are asked to submit forms no later than 6 weeks prior to their trip to give the committee time to consider the application.

Students that receive this scholarship are required to submit a report for publication in the newsletter, "The Victorian Geologist", following their trip. A presentation may also be requested by the committee, which will consist of a short, 10-15 minute presentation prior to the monthly seminar.

Applications forms can be scanned and emailed to: secretary@vic.gsa.org.au

or mailed to:

Geology Research Scholarships Victoria
Geological Society of Australia (Victoria Division)
GPO Box 2355
Melbourne VIC 3001

More information including eligibility criteria can be found on the form and by contacting Barbara Wagstaff (wagstaff@unimelb.edu.au)

Something interesting to share? Want to see your name in print?

Don't be bashful, contribute to the GSA(V) monthly newsletter!

If there are any events, happenings, news, or views that would be of interest to the membership, please send your details and information to Matt Bliss at mbliss@student.unimelb.edu.au

We'd be glad to hear from you

FORTHCOMING SEMINARS AND EVENTS

to be presented at

GSA (Victoria Division) meetings

Note: unless otherwise indicated, all 2011 talks will be held in the Fritz Loewe Theatre, Earth Sciences Building, University of Melbourne.

November 24	Marion Anderson *Astrogeology*

Please join the GSAV in welcoming these new members

Helen Green
Damiano Dell'Ertoile

Visit the GSAV on www.vic.gsa.org.au or the GSA on www.gsa.org.au
• Renewing your GSA membership is easy - it can now be done online. •

CONSIDER CONTRIBUTING TO TAG!

It is member contributions which make TAG a member magazine – please keep the contributions coming and assist with informing all of the membership (not just your Division) about your activities.

Please send your news to: tag@gsa.org.au

GSA (VICTORIA DIVISION) COMMITTEE

Please address all correspondence to the GSA Victoria Division
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