



New approach to uranium-gold systems



A team led by Dr David Selley from CODES, and Prof. Murray Hitzman from the Colorado School of Mines (CSM) node, is proposing a research project to develop and test a holistic exploration model for the formation and location of polymetallic U-Au-PGM-Ni-REE-Mo-Co ores.

The project builds upon expertise in sediment-hosted base-metal ores (Cu-Co and Pb-Zn) that has been developed through two decades of research on some of the world's most richly endowed basins, including McArthur Basin in northern Australia and the Katangan Basin in central Africa. The project also includes intellectual capital developed through recent research of world-class sediment-hosted Au provinces - in particular, concepts of organically-mediated metal concentration.

In developing the models, emphasis will be placed on understanding the significance of precious metal and base metal enrichment

in these deposits, and the conditions under which they attain ore grade concentrations.

Consideration of these polymetallic deposits as a spectrum between end-

continued page 2 »

Temple Mountain, Utah – one of the sites selected for deposit case studies. The mountain is famous for its polymetallic urano-organic ores, which include fracture-controlled varieties within and at the margins of a transgressive collapse breccia, and greater stratabound concentrations within sandstones of the Moss Back Member. Bleaching within the collapse (reduction of iron) and abundant petroliferous organic matter within peripheral sandstones record infiltration of mobile hydrocarbons.



In this issue:

SEG students in Indonesia	3	Grim trip	10
Portable analyser analysed	6	Tungsten, fire and ice	12
South American short course	8	Another Fox in Tasmania	14

« continued from page 1

members will provide important insight to metal sourcing, transport, and ultimately the distribution of ore-grade metal accumulations in sedimentary basins.

The project will include 3 modules:

- **Metal sources and transport** – a series of studies examining the relative roles of organic-bearing strata and Fe-oxide-bearing 'red bed' strata as metal reservoirs, and the conditions under which various metals can be released into solution. The studies aim to reveal criteria that determine a basin's fertility from the perspectives of metal source and transport.
- **Deposit case studies** – comparative studies of deposits from central Africa (Shinkolobwe), northern Australia (Coronation Hill, Rum Jungle), USA (Temple Mountain), and South America (Serra Pelada). The deposits and host basins will be selected to include a spectrum of stratal types and positions, association with (former) organic matter, and diversity of metal associations from U-dominated to Au-PGM-dominated end-members.
- **Basin architecture** – structural, lithostratigraphic, and hydrodynamic studies examining the positions of various ore types within their respective host basins. The studies develop predictive models for

ore location, and examine the potential for systematic basin-scale metal zonation.

The search for answers

Answers will be sought to several key questions regarding the U metallogeny of sedimentary basins, including:

- What are the factors that control the location of polymetallic U deposits, their size, grade and potential for significant credits of Au, PGM, Ni, REE, Mo, and Co?
- Is there a spectrum of polymetallic U deposits related to different stages of basin evolution – from early diagenesis through orogenesis? And can different deposits be found in the same basin?
- Do the various components of polymetallic U deposits share a common source?
- Is it possible to relate variations in metal ratios and absolute concentrations to variations in metal source type?
- Is the zonation of U, Au, PGM, Ni, Mo, Co, and Cu apparent in some basins (e.g. Katangan Basin) unique?
- What is the potential for significant base metal and precious metal mineralisation in provinces known mainly for their U endowment (and vice versa in the case of Cu-rich basins)?
- How do polymetallic U deposits in different geologic settings compare with classic unconformity-related U deposits

in terms of timing, structural control, alteration and geochemistry?

- What are the similarities and differences in terms of metal sources and the types of fluids involved in the transportation and mineralisation?

The team

The project is being facilitated and funded through AMIRA International. In addition to the team leaders – Dr Dave Selley and Prof. Murray Hitzman – the other team members are: CODES personnel: Dr Stuart Bull, Dr Garry Davidson, Assoc. Prof. Jeff Foster, Prof. Ross Large, Dr Karin Orth, Dr Robert Scott, plus Dr Poul Emsbo from USGS, and Dr Robert Duncan, Prof. Thomas Monecke and Prof. Sam Romberger, all from CSM.

Sponsorship

It is anticipated that sponsorship will be an attractive proposition for companies exploring for, and developing, uranium, gold, PGMs and related base metal deposits. There will be two types of sponsorship, aimed at major and junior levels of participation.

For further information and sponsorship opportunities contact:

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Teaching in the City of Gold



Ross Large lecturing in Johannesburg, South Africa. During March, Ross and Stuart Bull presented a five-day workshop to 20 Vale geologists entitled Ore forming processes in sedimentary basins. Johannesburg is often referred to in South Africa as Egoli, which is a Zulu word meaning 'city of gold'. The name is derived from the city's rich gold mining history.

Highs, lows and eruptions

All part of the day for SEG students in Indonesia



Left: A bird's eye view of the processing plant at Grasberg taken from the cable car transporting the SEG team.

Below: Bronto Sutopo and Fiona Best on Krakatau.



The SEG student chapter has completed a hectic, but highly successful, 11-day field excursion to Indonesia that included visits to five Indonesian islands, three mine sites and two active volcanoes. Highlights of the trip were a tour of the legendary Krakatau volcano (which in 1883 was the site of one of the world's most cataclysmic eruptions), a journey underground at Pongkor and an ascent to the heights of the world-famous open pit mine at Grasberg.

The field trip, entitled *'The Mineralisation and Volcanism of Indonesia'*, enabled the participants to observe economic epithermal and porphyry deposits, study the lavas of active volcanoes, and gain an overall understanding of the geodynamical evolution of the country. Six industry representatives and eight students from CODES attended the trip, with participants originating from Australia, and as far afield as the UK, Canada, Columbia, Indonesia, Italy, Japan, Peru, Russia and Thailand.

The beginning of the tour was timed to coincide with a conference in Jakarta, organised by the Indonesian Society of Economic Geologists (MGEI), entitled *'Sumatra Metallurgy at a Glance'*. With presentations with titles such as *'1883 Krakatau Eruption'* and *'The Status of Gold Resources and Exploration in Indonesia'* the conference provided the perfect starter to whet the appetite for what was to follow.

The official start to the field trip commenced with a visit to Carita, West Java, where the participants were captivated by a large collection of Pliocene silicified trees that were so well preserved that, in places, the cell structure of the original wood was

still visible. On day two, the group endured a rather wet and bumpy boat ride to Krakatau in the Sunda Strait, where they observed several generations of lava flows at the base of the volcano, before scrambling through the steam to see the craters at an elevation of approximately 300 m. On the final day on Java, the group visited Pongkor gold mine where they were taken 500 m underground to observe the mineralised quartz-adularia-sericite veins.

The next two days were spent in the province of Papua where they learned about the famous Grasberg porphyry Au-Cu deposit. The group attended lectures on the regional geology and characteristics of the Grasberg deposit, and then made observations of the porphyry ore bodies, sulphide-rich skarns and country rocks in core. They then travelled to an elevation of >4000 m for a geological tour of the vast open-pit operations.

Next stop on the demanding but eventful schedule was the Batu Hijau gold-

Highs, lows and eruptions

« continued from page 3

rich porphyry copper deposit on the remote island of Sumbawa in the Lesser Sunda Archipelago. During a two-day stay at Asia's second largest copper mine, the group was given a tour of the operations and briefed on the geology and mineralisation of the ore body. They were also afforded the opportunity to view core from the mineralised bodies and country rock.

The final two days of an unforgettable journey were spent in Bali visiting the active Mount Batur volcano where the group

learned about its history and evolution, studied the active crater and observed the lava flows and ignimbrites at its base.

Congratulations to the main organisers, Fiona Best and Bronto Sutopo, on a highly rewarding and well-planned 11 days.



Above: The sign says it all.

Left: Dr Clara Wilkinson takes a photo of a petrified tree on the way to Pongkor.

Plans for symposium gather pace

Planning for the special symposium to mark CODES' 20th anniversary is progressing well. A number of prominent speakers have already confirmed their participation, and many others are expected to finalise their involvement in the next few weeks.

The event will open in a relaxed manner on the morning of Thursday, 3 December with a tour of the centre, which will include a look at the current facilities, plus a few nostalgic journeys down memory lane. The relaxed format continues in the afternoon with a barbecue, and a game of cricket for those not born before the Holocene epoch. To round off what promises to be a thoroughly enjoyable opening day, there is a wine tasting in the early evening featuring

some of Tasmania's finest cool climate varietals.

It is down to the serious business on days two and three with a full program of top local, national and international speakers, who will deliver presentations on a range of ore deposit related themes involved in CODES research development including: tectonics, volcanology, VHMS, Sedex, porphyry Cu-Au, sediment-hosted gold, sedimentary copper, geophysics, geometallurgy and future directions.

The main symposium ends on Saturday, 5 December, but adventurous participants have the option of a four-day field trip to visit the famous ore deposits on the west



The symposium will be followed by a four-day field trip to Tasmania's west coast.

coast of Tasmania. The trip will encompass the full spectrum of styles of mineralisation in this geologically-rich area.

For further details, see the advertisement on page 11 of this issue of Ore Solutions.

Roundup 2009 in Canada

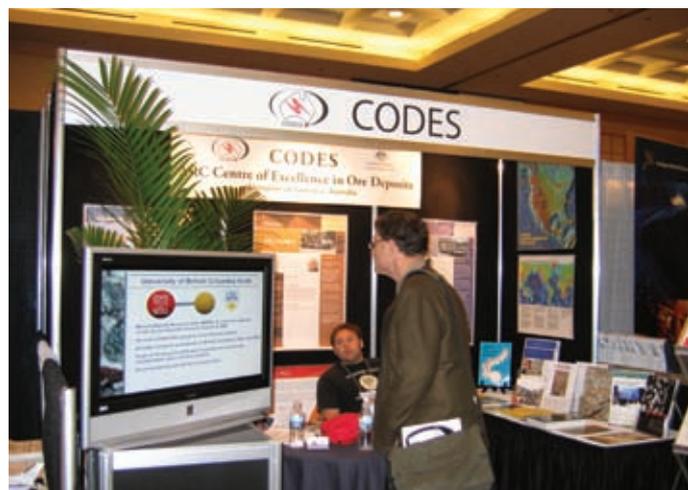
CODES continued its participation in the annual Mineral Exploration Roundup conference and trade show, which is now in its 26th year.

Despite the difficult economic times, the Vancouver-based event was attended by over 5800 people from 48 countries, cementing its position as one of the world's premier technical mineral exploration conferences. In addition, the trade show component of the proceedings attracted an impressive 257 booths – a record for Roundup.

The CODES booth was managed by Jeff Foster, ably supported by Patrick Sack, Sarah Gordee and Dave Selley. The team reported that they received a steady

stream of visitors throughout the event who were eager to learn about the Centre's capabilities through a series of offline and online visual presentations.

In parallel to participating in the event, fruitful meetings were held with a number of major mining organisations including the Vale Group, Anglo American, Teck, and the Fronteer Group. Potential projects discussed related to uranium, gold deposit modelling and advanced EM processing.



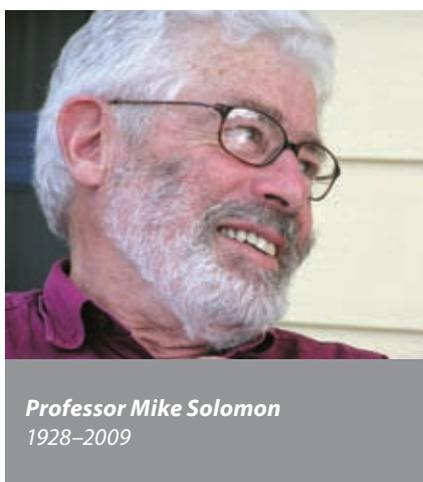
The CODES booth provided a blend of static and video / web-based presentation materials.

Farewell to a friend

We are deeply saddened to report the passing of Professor Mike Solomon on May 27. Mike played a leading role in the development of Economic Geology, both in Australia and internationally.

He had numerous achievements during a highly distinguished career, which include his pioneering work with volcanic-associated deposits, which put the Mount Read Volcanic Arc firmly in the lexicon of geologists around the world.

Traits that were always abundantly evident throughout his working life were his desire and ability to test the limits, which often led to new ways of thinking and advances in the understanding of the science. For instance, one of his many respected and influential publications was *The Formation of Massive Sulfide Deposits on the Seafloor* – co-authored with John Walshe and published in *Economic Geology* in 1979. This visionary work correctly predicted the existence of 'black smokers' on the seafloor long before they were discovered in deep sea dives – a view that was met with



What you leave behind is not what is engraved in stone monuments, but what is woven into the lives of others.

– Pericles

a great deal of scepticism from his peers at the time.

In 1972, he initiated the first papers on the evolution of ore deposits in relation to the plate-tectonic evolution of the Tasman Orogenic Zone, and his book *The Geology and Origin of Australia's Mineral Deposits*

(co-authored with David Groves) is still considered the premier overview of those deposits and their setting more than 15 years after its publication.

Among Mike's many accolades were the Heemskirk Medal (1979), the Stillwell Award (1987) and the Penrose Medal (2008).

In addition to his many academic achievements, Mike will be remembered for his ability to bring geology alive and make it fun. As a young lecturer he was particularly popular with his students for his willingness to join in at social functions and his capacity to introduce intriguing topics to the lecture theatre. On one occasion his guest speaker gave a talk on 'Pyrite, Politics and Promiscuity in Cuba'.

Many of his students have gone on to become leading economic geologists in their own right, including David Groves, John Walshe, Geoff Green, Noel White, Chris Heinrich and Ross Large, to name just a few. They, like many other geologists, over many years, have looked upon Mike as a character, a leader, a mentor and, most of all, a friend.

The CODES SEG Student Chapter plans to introduce an annual Mike Solomon Memorial Lecture.

Portable analyser eases load

CODES has acquired a new Innov-X50 portable XRF analyser that provides quantitative and qualitative data for major and trace elements in a matter of minutes, and at a fraction of the cost of conventional XRF analyses.

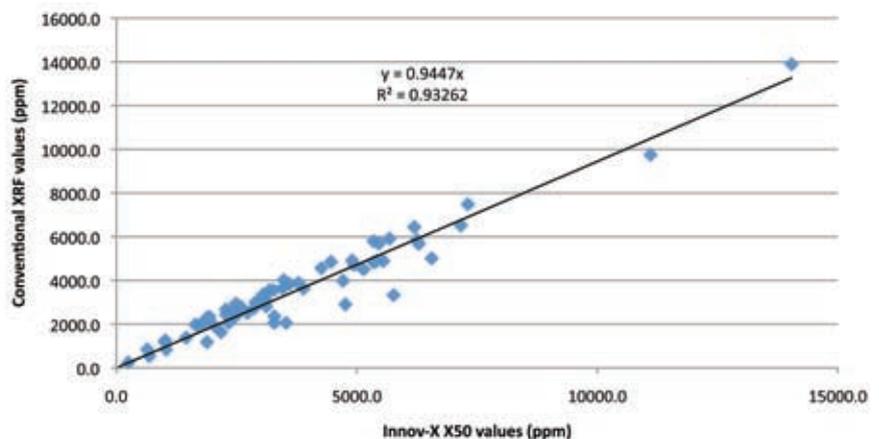
Additional testing and calibration are planned, but initial test comparisons against conventional XRF and laser ICP-MS data for selected standards are promising. Good quantitative results were obtained for an array of elements, including S, K, Ca, Ti, V, Mn, Fe, Ni, Cu, Zn, As, Se, Rb, Sr, Zr, Mo, Cd, Ba and Pb. Detection limits vary with sample type and matrix effects, but for powder pellets are commonly around 20 ppm for Cu, Zn, Pb and As.

Initially, the equipment was calibrated for shale-hosted Au deposits, using 68 samples as standards, which were previously analysed by conventional XRF methods. Results for other elements of interest were problematic for a variety of reasons. However, it is important to note that the X50 is designed to complement and not replace more sophisticated XRF equipment. Therefore, it is believed that, providing users are aware of the strengths and limitations of its design capabilities, the equipment will prove to be an extremely useful adjunct to existing analytical facilities.

"The portable X50 enables initial qualitative geochemical screening of rock samples, semi-quantitative spot analyses, and quick, inexpensive quantitative analyses of a range of major and trace elements. It is also small, lightweight, safe and easy to use. It is ideal for initial geochemical evaluation of sample suites and qualitative analysis of small-scale geological features, relationships and associations. Although it is less accurate and has higher detection limits than conventional XRF analyses, good quantitative data for selected elements can be gathered for a large number of samples at a fraction of the cost," says PhD candidate, Joe Moyer.



Joe Moyer takes the new X50 for a test drive.



Ti (ppm) X50 analyser versus conventional XRF.

Hardware, software and operation

The X50 uses a non-radioactive excitation source and a shielded sample chamber that accommodates samples up to 10 cm across. The beam sample area measures about 8 mm diameter and penetrates to a depth of up to 3 mm. The Windows XP operating system and X50 software operate from a touch screen, but a mouse and standard keyboard can be attached, if required. Although not designed to link to another computer, data are readily downloaded to a memory stick through a USB port and the machine can also be connected to the local network.

The system's Soil 3 Beam setting was developed primarily for soil samples, but has the versatility to be used to analyse trace elements at relatively low concentrations in rocks and prepared sample powders. The Process Analytical (Mining) mode is better suited to the higher element concentrations typical of ore-grade material, and allows users to create element specific factors.

Analytic results are displayed on screen in about three minutes and results from previous analyses can easily be reviewed. Operators can comfortably obtain around 100 readings in a six-hour period, and over 200 analyses have been achieved in a single day.

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The X50 can also analyse raw rock samples, although concentrations are often up to 50% lower than from powder

pellets. Generally good results are obtained for K, Ti, V, Cr, Fe, Rb, Sr, Zr and Ba, present in matrix micas, carbonate, and fine-grained disseminated sulphides and oxides. Raw sample suites can be screened for the general presence, distribution and range of concentrations likely for many minor and trace elements. Multiple readings that include matrix, veins, areas rich in cement, and concentrations of sulphide and oxide minerals (aggregates, veins, laminae,

porphyroblasts, etc.) provide qualitative data that can help to constrain the selection of samples and methodologies for more conventional analyses.

The X50 is also very useful for qualitative and semi-quantitative analysis of small-scale features and relationships in rock samples. Examples include spot analyses of veins and alteration haloes versus host rock, individual carbonate and pyrite porphyroblasts, bedding-parallel pyritic laminae, and small-scale vein features.

Key role in international marine geoscience forum

Professor Leonid Danyushevsky has been chosen as the initial convener of an important international initiative aimed at establishing a co-operative program for marine geoscience in the Western Pacific.

During a fruitful two-day meeting at the end of April in Busan, Korea, geoscientists from Australia, New Zealand, Japan and the host country agreed that there would be benefits for all parties if skills and resources could be shared between marine geoscientists working in the Asian Pacific region – and especially in the Western Pacific arcs and back-arc basins. It was felt that working together will create synergies that will enable each group to complement each other's capabilities in a number of areas including equipment, skills and knowledge. Although countries currently work together on selected marine geoscience projects, the co-operative efforts are often ad hoc and the belief is that a more systematic approach would add considerable value to research projects. The group are optimistic that once the project gathers momentum other countries with an interest in the marine geoscience



Prof. Leonid Danyushevsky, front row, far left, with fellow representatives in Busan.

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of the region will join the initiative.

Potential areas of co-operation discussed by the group include tectonics, marine geophysics, convergent margin magmatism, back-arc spreading centres, submarine metal

deposits, climate change and sedimentary processes.

The initiative is in the embryonic stages at present, but the group has already committed to an in-principle agreement for collaboration and established a formal working group, named the Western Pacific Marine Geoscience Working Group (WePMaG). As its interim Convenor, Leonid's first major task is to establish a formal collaborative agreement with all parties by the end of June.

The WePMaG meeting followed immediately after a meeting of the Asian Integrated Ocean Drilling Program (IODP) Consortium, which Professor Danyushevsky also attended as one of Australia's representatives.

South American short course

A cosmopolitan mix of Masters students from CODES, CET and EGRU completed the Ore Deposits of South America Short Course at the end of March. The field-based course, held in Chile and Peru, included visits to a total of 13 mines and exploration projects and involved participants from Australia, New Zealand, Indonesia, the Philippines, China, Mongolia, Zimbabwe, Canada, Switzerland and the United Kingdom.

Right: Trip leader David Cooke at the Toromocho porphyry Cu-Mo and skarn deposit, Peru.

Below: Box folds and thrust faults of the Domeyko Cordillera north of Chuquicamata, Chile.

Below right: Masters student Margy Hawke getting her first experience of a blizzard at 4800 m in the Peruvian Andes.





Above: Limestone outcrops in the Amazon rainforest of Peru, near the San Vicente MVT Pb-Zn deposit.

Above left: Volcan San Pedro (5974 m ASL), part of the active chain of volcanoes that separates northern Chile from southern Bolivia, with Cretaceous anorthosite of Cerro de Papas (mountain of potatoes) in the foreground.

Below left: The group at the Chuquicamata porphyry Cu-Mo deposit, Chile.



During their two-week excursion, the group visited a series of IOCG, porphyry, epithermal, skarn and MVT deposits, in addition to learning about the regional geology and tectonic evolution of the Andes.

As part of the assessment procedure, the students completed literature reviews

on South American ore deposits not visited on the excursion. The students were also required to give oral presentations on their literature reviews, which provided the group with a broader insight into the spectrum of mineralisation styles that South America contains.

The group experienced a wide variety of terrains, from the active volcanoes of the Atacama Desert and the snow-capped mountains of Central Chile through to the steamy Amazon rainforest. The group spent considerable time at elevations >4000m, with one student getting her first experience of a snowstorm as the group reached 4800 m in the Peruvian Andes.

The course was led by David Cooke and Bruce Gemmell, plus Thomas Bissig (MDRU) – who also had the daunting task of providing translations for presentations given in Spanish.

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Grim trip for students

Right: Stanley and its 'Nut' featured prominently in the itinerary.

Below: The group pause for rest on Woolnorth Tuff.

Far right: Columnar jointing on a mega-pillow lava at Stanley.



In March, the Volcanology Group and SEG student chapter completed a four-day field trip to north-west Tasmania, where they studied the area's exceptional pillow lavas, which occur within a Tertiary-age subaqueous mafic succession that is exposed across much of the region's coastline. The group of 15, comprised mostly of postgraduate students, focused on Cape Grim and the Stanley Peninsula, both of which contain extensive outcrops of subaqueous Tertiary basalts and basanite.

Fed by weather patterns dominated by the Roaring Forties, and the vast expanses of the Southern Ocean to the west, Cape Grim is famed for having the cleanest air in the world – officially measured at the CSIRO's Baseline Air Pollution Station. It is also known for its fair share of inclement weather, with an average 187 days of rain per year. However, heavy rainfall and the tempestuous nature of the Roaring Forties were not in the thoughts of this single-minded group of students as they set off to view an area rich in geological interest.

One of the many highlights of their visit to Cape Grim was the study of an extremely well-preserved coarse pillow fragment breccia on a large tidal platform and the adjacent cliff face. The best outcrops showed a three dimensional view into the internal structure of the pillow fragments, including extensional cracks and rinds that formed during the emplacement of the lava in a subaqueous environment. Another interesting feature of the trip was the discovery of natrolite (a type of zeolite), which was found in vesicles and fractures of the pillow lavas. Several kilometres along the coast, the group studied an exposure of the fine-grained, probably shallow-water,



Woolnorth Tuff and cross-cutting mafic dykes.

It is a fascinating geological area, which has inspired a study into the textures exposed at this locality by Dr Yoshihiko Goto (Muroran Institute of Technology, Hokkaido) and Prof. Jocelyn McPhie (CODES), who are proposing a new view on the propagation of pillow lavas on the seafloor.

At the nearby Stanley Peninsula, the group visited several interesting outcrops, including the famous 'Nut' – a ~140 m-high massive mafic intrusion that provided the perfect lookout over the coastal landscape and Tertiary volcanic formations. At the base of this iconic intrusion, the participants viewed a small, well-preserved coastal outcrop that included a typical example of a basanite peperitic dyke.

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Other points of interest in the Stanley area included a magnificent example of mega-pillow lava. This extensive structure contained polyhedral columnar jointing, with evidence of lateral transport of the lava into major tubes, which had been scattered into smaller pillows. They also viewed quenched-fractured sheets of lava that alternate with pillow lavas and thin beds of hyaloclastite, plus wonderful examples of fluidal emplacement of pillow lavas that resemble subaerial pahoehoe flows.

The Stanley area contains several outcrops that were recently the subject of two detailed publications by Dr Goto and Prof. McPhie.



Calling all alumni and friends of CODES to a special symposium

CODES
The First 20 Years



3–5 December 2009

This year marks CODES' 20th anniversary.

As part of our activities to celebrate this landmark event, we are holding a special symposium entitled *CODES – The First 20 Years*. People are invited who have played a role in our success over this period, including current and past students, staff and friends. This will provide a great opportunity to catch up with old acquaintances and colleagues and to join us in a celebration of the key milestones along our journey.

This would not be a CODES symposium if it simply looked back and did not cover topics at the forefront of our profession. This event will be no different. The program is in the planning stages at the moment, but be assured that we will be inviting a high calibre of speakers to present on topics at the cutting edge of developments. And we will not be forgetting the social side of things, with a number of recreational events being planned for participants and their partners.

For further information please visit: www.codes.utas.edu.au/20yrs

CODES – the ARC Centre of Excellence in Ore Deposits at the University of Tasmania



Tungsten, fire and ice

In the realm of the ancient King

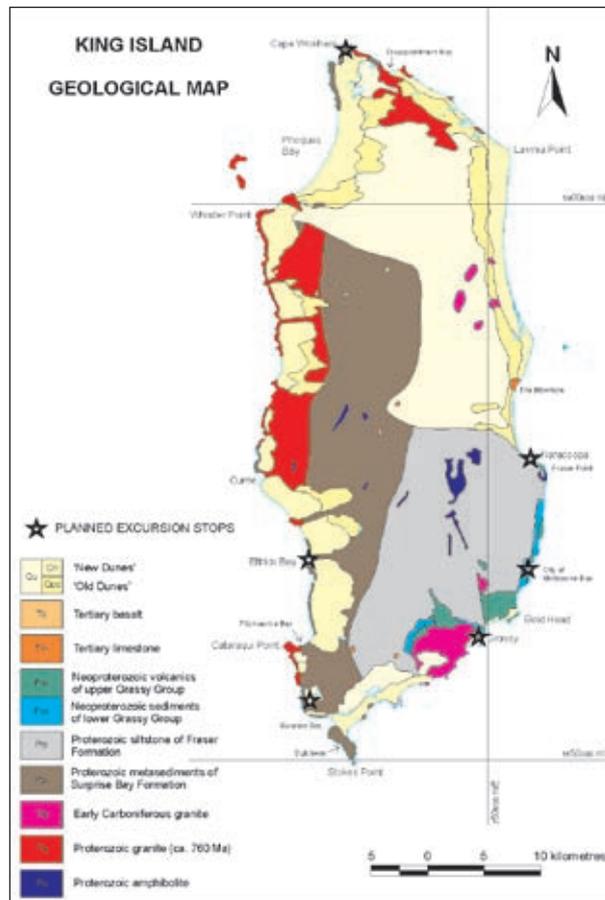
An intriguing field symposium entitled *Tungsten, Fire and Ice in the Realm of the Ancient King* was held in March, examining key aspects of the geology of King Island, which is situated off the north-west tip of Tasmania and forms part of an archipelago of 334 islands that constitute the state. The island is known in the minerals industry particularly for its exceptional deposits of tungsten-rich scheelite.



The event was convened by the Geological Society of Australia and organised by Dr Nick Direen and Dr Andrew McNeil of CODES, together with Dr Clive Calver of Mineral Resources Tasmania.

The main four-day event included a number of absorbing topics related to the geology of the island, which elicited many a lively and thought-provoking debate. Highlights of these discussions included:

- The controversy surrounding whether the Neoproterozoic (Ediacaran) Cottons Breccia on the island's east coast is a 'Snowball Earth' tillite, or a tectonic-related deposit.



- The nature of the well-preserved Neoproterozoic (Ediacaran) volcanics and intrusives of the Skipworth Subgroup, also on the island's east coast.
- The relationship of King Island to other Bass Strait islands, mainland Tasmania and Victoria and, in particular, whether these rocks are part of a much larger (continent-scale) breakup system.
- The nature of the island's world-class Devonian tungsten skarn mineralisation, hosted by metasomatised Ediacaran Grassy Group rocks.

The symposium was well attended by 24 geologists from all around Australia. Attendees included industry geoscientists, academics, consultants, students, state and federal survey geologists, and even a few adventurous retirees.

A highlight of the symposium was a visit to the island's exceptional scheelite deposits,

arranged courtesy of King Island Scheelite Limited, who sent CODES graduate Dr Alan Chester to the symposium. The company is currently conducting feasibility studies with the aim of re-commencing mining operations, which ceased in 1990.

Other significant geological features visited during the excursion included an exposed type locality of the Neoproterozoic Wickham Orogeny at Cape Wickham; deformed Mesoproterozoic metasedimentary basement rocks at Naracoopa; field traverses within the Neoproterozoic Grassy Group around City of Melbourne Bay; and Devonian skarn alteration within the Grassy Mine pit.

An additional two-day trip was organised, in conjunction with

David Taylor from Geoscience Victoria, to Waratah Bay and Cape Liptrap in Victoria. This optional part of the symposium investigated Cretaceous cover sequences of the Gippsland Basin, and Siluro-Devonian metaturbidites of typical Lachlan Orogen affinities. Participants also examined mafic metavolcanic and intrusive basement rocks around Waratah Bay (the postulated 'Selwyn Block' that underlies Devonian carbonate facies), plus well-exposed folded deep marine turbidites at the classic Cape Liptrap locality. The participants noted that the older rocks at Waratah Bay appeared to have distinctive Tasmanian affinities, which initiated interesting discussions in the context of what had been observed on King Island.

Students with latitude – from left, Zhaoshan Chang, Martin Jutzeler, Sarah Gordee, Susan Belford and Patrick Lyons (Lincoln Minerals).

King Island Geological Map, Courtesy of Mineral Resources Tasmania.

Visitors to CODES



Jim Webster from the American Museum of Natural History.

Curator samples Tasmania

Jim Webster, Curator and Professor: Physical Sciences & Earth & Planetary Sciences at the American Museum of Natural History, was a recent high profile visitor to CODES.

Professor Webster delivered a seminar entitled *Constraints on Magmatic Volatile-Component Behaviour from Apatite and Melt Inclusion Data*, which looked at an apatite in eruptive calc-alkaline system from the perspective of understanding volatile

behaviour in volcanic and potentially related plutonic systems. During his visit, he attended a number of meetings with staff who were eager to share ideas and learn from the eminent visitor. He also took the opportunity to sample magmatic-hydrothermal features from the Western Tasmanian Sn granites. Jim was accompanied on his trip to the state's west coast by Zhaoshan Chang, Jamie and Clara Wilkinson and David Cooke.

Soviet reunion

Collaborative work with CODES on the giant Sukhoi Log gold deposit has led to a three-month visit by two eminent researchers. Prof. Valeriy Maslennikov and Dr Svetlana Maslennikova from the Institute of Mineralogy at the Russian Academy of Science arrived at the end of March to work with Ross Large and Leonid Danyushevsky on trace element zonation in Phanerozoic black smoker chimneys and the theory of seafloor evolution in clastic sulphide deposits.

The previous collaboration with Valeriy proved highly successful, with the research on Sukhoi Log leading to the development of a new genetic model for black-shale-hosted Au-As deposits that has major implications for the exploration of Carlin and orogenic gold-arsenic deposits.

It is anticipated that this fruitful



Prof. Valeriy Maslennikov and Dr Svetlana Maslennikova, visitors from the Institute of Mineralogy at the Russian Academy of Science.

collaboration will continue to gain strength, with the team already planning their next project – research on the mineralogy and geochemistry of the Kumtor black shale-hosted gold deposit in Kyrgyzstan.

Moving in



Ross Olsen

has been appointed as a Geophysics Technician, working with Anya Reading, Mike Roach and Jeff Foster.



Mathieu Ageneau

PhD student, from France, will be working with Dave Cooke and Leonid Danyushevsky.



Heidi Berkenbosch

PhD student, from Canada, will be working with Dima Kamenetsky and Jocelyn McPhie.



Leon Graham

PhD student, will be working with Anya Reading on geophysics IT support.



Guan Jianxiang

PhD student, from China, will be working with Leonid Danyushevsky and Tony Crawford.

Hard Rock Café

The lighter side of CODES

Another Fox in Tasmania



Postgrads Nathan Fox and Anita Parbhakar tie the knot at a ceremony held in the Royal Botanical Gardens, Sydney.

Hitched at Hatchers



CODES' Research Technician, Shaun Inglis, was married to Ingrid (née Wijgers) at Hatchers Manor in Tasmania's historic Richmond Village at the end of March.

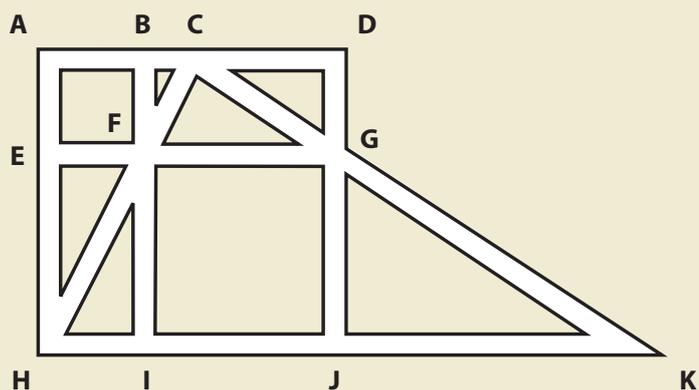
Geomentallurgy

The case of the spotted geologist

Remember our three geologists from the last puzzle? Well, they have now wandered into town to try to find a colleague. They know that the person will be walking in a particular area of town, but they are not sure of the precise location that their friend can be found.

"Looking at this map, if we split up, and one of us stands on each of the following three points, between the three of us we will have a view of every street in the area," said one of the geologists.

Which three points on the map did they choose? No explanations are required, just three letters will suffice. Email entries to: steve.calladine@utas.edu.au by Friday, July



31. The winner will receive \$50 – in these tough economic times, we thought that cash would be a welcome prize.

Solution to the previous puzzle

The trick was in the way the amounts were added up. Each person paid \$9, which totals \$27. Of this amount, \$25 went to the

manager and \$2 to the assistant. There were a number of creative answers, and not all were on the right track. However, of those that were following the correct train of thought, the first name out of the hat was Vincent Paul St John from the University of Melbourne. A CODES windcheater vest is on its way to ward off the winter chills.

Outreach

Our involvement in the community

Hellyer Academy visit

Students from the Hellyer Campus of the Tasmanian Academy visited CODES at the end of April. Although this looks like a scene from *Dead Poets Society*, it is actually Senior Lecturer Mike Roach conducting an entertaining and highly interactive demonstration of transverse waves.



Close encounters of the Third Age kind



Prof. Bruce Gemmell keeps his 'third age' audience captivated with his presentation entitled Seafloor Origin of Mineral Resources.

A series of lectures covering a range of geological topics was presented as part of the University of the Third Age (U3A) program during March, April and May. The lectures, held at the Kingston Adult Education Centre, were delivered to an eclectic mix of retirees from the local community, most with little more than a very basic knowledge of the principles of geology.

Personnel delivering the lectures included Prof. Pat Quilty, Dr Garry Davidson, Prof. Bruce Gemmell, Dr Andrew McNeill and Dr Peter McGoldrick. The team tackled a diverse spread of subjects that covered the basics of geology, while ensuring that there was a balance of material that related directly to Tasmania. In addition to basic

geology, subjects included Tasmania's long association with Antarctica, mineral resources within the state, how Tasmania was formed and how the world looked before that geological process took place. The team also tackled highly topical subjects, such as carbon storage as an effective means of limiting CO₂.

The University of the Third Age program was founded in Toulouse, France in 1972 with the aim of improving the quality of life of older people through a series of low-cost academic courses. After considerable success in Europe, the program established a foothold in Melbourne, Australia in 1984 and now has operations in all states and territories. The word 'University' is used in the context of its original meaning as a place of meeting and discussion – rather than as a place with entry requirements and examinations. The term 'Third Age' refers to a stage in life of active retirement – the first two stages being 'youth' and 'work/homemaking.'

Yunnan research augments SE Asia project

A new initiative in China's Yunnan province will increase knowledge of the geology of the area, provide insights into the evolution of the Paleotethys, and augment the geological database for the metallogeny and tectonics of the greater SE Asia region.

The initiative is an important extension to the *Ore Deposits of SE Asia* project, which built on the success of the ARC Linkage Project *Geochronology, Metallogeny and Deposit Styles of the Loei Fold Belt in Thailand and Laos*.

The research, named *Ophiolites and Volcanic Belts in Yunnan – Metallogeny and Tectonic Evolution*, is the PhD project of Chun Kit Lai (better known simply as Kit). One of the exciting aspects of the research is the highly complex nature of the geology of the area, which consists of at least two ophiolite belts, two Late

Paleozoic to Mesozoic volcanic belts and many granite plutons. In mid April, Kit and Dr Sebastien Meffre conducted an extensive field trip to the geologically-rich locality, where they visited 140 sites within its five magmatic belts, collecting over 100 rock samples of various lithologies. Results from the analysis of these samples will form an important part of a larger petrological, geochemical and geochronological database that will be released to the sponsor of the *Ore Deposits of SE Asia* project in 2010. Data will also be correlated with results from similar rocks from other parts of SE Asia; including Vietnam, Laos, Cambodia, Thailand, and Malaysia.

Key collaborations for the research have been established with Dr Song and Dr Liu, who are both senior researchers from the Institute of Geochemistry in Guiyang, China.

Chun Kit Lai examining ophiolitic pillow breccias basalt in Yunnan province.



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