

# Goldschmidt 2010 Knoxville, Tennessee June 13–18, 2010



PHOTO COURTESY MARIE-AUDE HULSHOF

More than 2000 delegates gathered in Knoxville, Tennessee, to attend Goldschmidt 2010, the 20<sup>th</sup> Goldschmidt Conference. The Knoxville tourist brochure states that the city has “175,000+ tour guides, also known as Knoxville residents,” and indeed everyone I met seemed very proud of their city and went out of

his/her way to make attendees feel welcome. There is also something to be said for holding a meeting in a relatively small city: once you get there, the focus becomes the meeting as there are fewer distractions to pull you away from the talks.

The brand-new Knoxville Conference Center was the perfect venue for the meeting. As all events were under one roof, it was easy to navigate from session to session, to meetings, to plenaries, and to posters. As we have come to expect from a Goldschmidt Conference, the technical program was exciting and covered the whole gamut of the Earth sciences, under 22 themes and with 15 concurrent sessions. And of course, for every time slot during the week, there were difficult choices to make. An interesting point was made by Mike Hochella, coorganizer (with Frank von der Kammer) of theme 17, “Nano-Geo and -Environmental Science: A New Frontier”: 10 years ago, there were 4 talks on nanogeoscience, while at this conference, there were 120 and the “nano” sessions ran for the whole week. Thursday featured a special session highlighting *Elements'* fifth anniversary. Mike Hochella and Bruce Watson, past principal editors, chose the theme “Geochemistry Far from Equilibrium.”

The traditional Sunday-night icebreaker was well attended. It set the tone for the imaginative southern cuisine we were going to sample through the week (how about mashed potatoes with toppings served in a martini glass!). The live bluegrass music provided a good background for conversation and catching up with friends.

Each day started with a plenary lecture. All were well attended, with lots of young people sitting on the floor at the edges of the room. At the opening ceremony on Monday morning, Tennessee Senator Lamar Alexander made a strong case for nuclear power as the energy of the future. He reviewed all the energy sources in terms of the land used to produce it—an interesting concept. For example, the land occupied by one nuclear plant producing enough power for 90,000 homes is one square mile. To produce the same amount of energy, solar power would require 15 square miles, petroleum 18. Eric Oelkers, president of the European Association of Geochemistry, followed with the first plenary, “How Can Geochemistry Save the World?” Our dwindling resources in the face of the increased consumption of nearly all metals are one of the many challenges faced by humanity. He stressed that our community needs to explain both the risks and the scientific solutions to major global challenges. John Parise (“Opportunities at Light Source and Neutron Facilities”), Don De Paolo (“Carbon Sequestration Geochemistry”), Sue Brantley (“Bedrock to Soil: Where Rocks Meet Life in the Critical Zone”), and Jérôme Chappellaz (“Greenhouse Gases and their Isotopes in Firn Air and Ice Cores”) were the plenary speakers on the other days of the week. These plenary talks are all available at [www.goldschmidt2010.org](http://www.goldschmidt2010.org).

The return of a poster session time slot with no concurrent sessions is to be applauded. Moreover, the posters, hosted in the exhibit hall in proximity to the exhibitors, stayed up for the full day, compared to the half-days of last year. Many of the exhibitors return year after year, a sure



From left to right, Barb Dutrow, Alex Navrotsky, Lee Penn, and Dana Medalist Jill Banfield. The Dana Medal presentation was made during session 17a – “Nanoparticles Important to the Environment: Structure, Reactivity, Analysis.”



Late afternoon snacks in the exhibit hall

sign of their commitment to our community: Thermo Fisher Scientific, Cameca, Australian Scientific Instruments, Cambridge University Press, Springer, Nu Instruments, IsotopX, Saville Corporation, Wiley-Blackwell, to name a few.

Another highlight was the Wednesday afternoon panel discussion on the theme “Energy & Environment.” Panelists included Sally Benson, Director of the Global Climate and Energy Project at Stanford University; Linda Gundersen, Acting Associate Director for Geology at the U.S. Geological Survey; Adam J. Rondinone, Legislative Fellow in Senator Lamar Alexander’s office; and Sherri Stuewer, Vice President for Environmental Policy and Planning at ExxonMobil. Unfortunately, Wednesday afternoon is traditionally the half-day break in the conference, and the excellence of the presentations deserved a full house: perhaps this event should be moved to a prime-time spot in future conferences. I found the presentation by Rondinone fascinating. The problem according to him is not understanding climate change, but agreeing on a solution. In a public opinion poll, people listed the economy and jobs as the top two issues of concern, while climate change was thirtieth and last on the list... and politicians respond to the concerns of the public. An increasingly large part of the public also thinks that the threat of global change is exaggerated. These presentations are all available at [www.goldschmidt2010.org](http://www.goldschmidt2010.org).

The tour of the Spallation Neutron Source and the field trips to Great Smoky Mountains National Park and Trans-Blue Ridge were all filled to capacity, so you were out of luck if you had not booked early. A preconference Quality Assurance workshop run by the International Association of Geoanalysts and a Teaching Geochemistry workshop were also offered to participants.

As Rod Ewing alluded to in his Triple Point column, “Is Geochemistry Important?” (*Elements* 5: 205), the Goldschmidt Conference seems to have tapped into the fountain of youth. This was also the case this year, with 554 students in attendance, making up 25% of the participants.

The meeting ran smoothly, and the level of satisfaction was high. To organize such a large meeting requires an extraordinary amount of dedication and hard work. Kudos go to the organizers, Ted Labotka (University of Tennessee, Knoxville), Dave Cole (Oak Ridge National Laboratory), and Hap McSween (University of Tennessee, Knoxville); to the University of Tennessee Conferences and Cambridge Publications teams; and to the army of dedicated, ever-smiling volunteers (see also page 256).

For that one week, Knoxville was no doubt the geochemistry-mineralogy-petrology capital of the world. Next year, it will be Prague! See you all there!

**Pierrette Tremblay**, Managing Editor, *Elements*

## Metasomatism in Oceanic and Continental Lithospheric Mantle\*

The generation of magmas and fluids at various depths in the Earth, their role in shaping the interior/exterior of our planet, and their unmistakable record in mantle specimens are topics that have come of age. Investigations of mantle melting have evolved from simple documentation of compositions of terrestrial materials to field and laboratory experiments for determining the controls on such melting processes. Natural specimens have allowed us to quantify melting processes in the mantle, and we have made unprecedented progress in understanding mantle metasomatism. Simply put, mantle metasomatism is a consequence of melt/fluid flow through the mantle, which results in melt–rock and fluid–rock interaction. The subject matter of the volume edited by Coltorti and Grégoire, mantle metasomatism has received widespread attention in the literature on orogeny, ophiolites, and xenoliths.

The editors have compiled 14 contributions on mantle metasomatism. The volume begins with an excellent synopsis by **Coltorti and Grégoire**, two geologists who have devoted a large part of their careers to understanding mantle melting. The lead article, by **Piccardo**, summarizes research in Alpine geology and addresses Jurassic Alpine ophiolites. Lithospheric extension and passive upwelling caused mantle melting, and MORB-type melts reacted with the overlying peridotite. The paper concludes with a model consisting of accretion and melting. **Ishimaru and Arai** discuss calcic amphiboles in mantle-wedge spinel peridotites from the Kamchatka region. Since the reequilibration temperatures of the xenoliths are in the 900–1000°C range, tremolite must have formed during retrogression, after high-temperature metasomatism. The authors suggest that the melt responsible for metasomatism was derived from a siliceous and sulphur-bearing subducting slab. **Ntaflos and coworkers** describe recrystallized spinel peridotite xenoliths from the Viliga volcanic area in Russia. Bulk-rock rare earth element (REE) concentrations are elevated, and owing to the lack of similar enrichment in clinopyroxene, the authors conclude that intergranular fluids/melts are responsible for the bulk-rock REE signature. Model calculations indicate that 2–15% melting is required for the observed REE concentrations. On the basis of geochemistry, **Seghedi and coauthors** infer that an unusual lamproite from Romania was derived from melting of a garnet harzburgite that was preconditioned by alkaline melts. **Orejana and Villaseca** describe pyroxenite xenoliths, from lamprophyres and diabases of the Spanish Central System, containing Ti-bearing phlogopite and pargasite-kaersutite series amphiboles. They suggest that metasomatism was due to the influx of carbonated, siliceous, or hydrous fluids/melts, perhaps derived from the fractional crystallization of a primary, carbonated, hydrous, alkaline magma. Melt–rock interaction may have caused high radiogenic Nd isotope concentrations in the metasomatized xenoliths. **Galán and others** discuss spinel peridotite, harzburgite, and pyroxenite xenoliths hosted in alkaline, mafic lavas from Spain and conclude that, prior to at least two episodes of cryptic metasomatism, melt was extracted from these rocks. Metasomatism related to both siliceous and carbonatitic fluids/melts affected mainly harzburgites. **Demény and colleagues** describe the major element and isotope compositions of amphibole, biotite, pyroxene, and feldspar from gabbros and basalts at La Palma, Canary Islands. A Sr isotope ratio in amphibole similar to that of average mantle and the stable isotope compositions of pyroxene and amphibole suggest their derivation from Earth's mantle. On the other hand, meteoric water affected the isotope compositions of biotite and feldspar. Based on hydrogen isotopes, the authors propose the involvement of a mantle plume. **Touron and others** discuss spinel peridotite and harzburgite xenoliths from the Massif Central (France). Trace element concentrations and O–Sr–Nd isotope data from clinopyroxene and amphibole suggest variable degrees of metasomatism and melt extraction in the mantle.

**Perinelli and coauthors** discuss petrography and mineral chemistry of spinel peridotite xenoliths from the Hyblean plateau, Sicily. Melt has been extracted from these xenoliths, which also show evidence of cryptic metasomatism. The authors conclude that the rocks interacted with alkaline silicate and hawaiiite-like melts and that the temperature conditions were not consistent with a thermal plume. **Ismail and others** describe amphibole-bearing spinel harzburgites and rare lherzolites and wehrlites from a volcanic province in Syria. They propose



that carbonated silicate melts, during interaction with the rocks, evolved to highly carbonated liquids. **Beccaluva and others** describe reaction textures and metasomatic overprinting in spinel lherzolite xenoliths (enclosed in alkali basalt–hawaiiite lavas) from Libya. Similar trace element concentrations in bulk rocks and clinopyroxene suggest enrichment due to melt invasion. The specimens record long-term isotope depletion and HIMU-type (that is, high U/Pb) chemistry. The authors dismiss a mantle plume origin for the observed features.

**Perinelli and colleagues** discuss experiments at elevated pressures and temperatures. To explore melt–rock interaction, melanephelinites from Antarctica were reacted with lherzolite and wehrlite. The most significant chemical changes occur in clinopyroxene, olivine, and spinel, leading the authors to conclude that the perpetrator melt modified its own chemistry during reaction with the crystalline assemblage during the experiments. **Bonadiman and others** describe mantle peridotite xenoliths from two localities in Scotland. On the basis of the isotope composition of clinopyroxene from one location, the authors infer metasomatism by a melt derived from a subducted slab consisting of altered oceanic crust and some sediment. The geochemistry of clinopyroxene from the second location suggests interplay between kimberlitic and carbonatitic melts. In the final contribution, **Ashchepkov and others** use mineral-chemical data from xenoliths/xenocrysts and previously calibrated experiments to formulate four new monomineralic thermobarometers: jadeite-diopside, garnet, Cr-spinel, and ilmenite. Based on these, the authors propose that the sections above and below a ubiquitous pyroxenite layer in Yakutian mantle are, respectively, fertile and depleted. The observations are explained by melt-percolation processes.

This well-written book is illustrated with numerous color photographs, and simple tables are included in several chapters. Some chapters have black-and-white illustrations that work well. The book is 361 pages long, hard bound, and hefty, and appears to be free of typographical errors. However, the book also has a number of shortcomings. For example, most of the melt–rock reaction scenarios reflect a divorce between major and minor elements. Although major element data are presented, the models are based almost entirely on trace elements. In one chapter, the authors propose that carbonatitic fluids/melts involved in metasomatism evolve from alkaline silicate parent magmas, while in the next chapter, exactly the opposite – alkaline silicate daughter melts produced from carbonatitic parents – is preferred. Therefore, the proposed modes of metasomatism, in various guises, are mutually contradictory. Although the book is supposedly devoted to both continental and oceanic mantle, about 85% of the contributions focus on the former. Surprisingly, the book lacks contributions on mantle melting and phase equilibria, as well as on experimental studies of the genesis of hydrous fluids, carbonatitic melts, their interaction with different lithologies in the mantle in various tectonic settings, the record of melts/fluids entrapped in diamonds, and the effect of metasomatism on the fabric of mantle specimens. For geologists who are not members of the Geological Society, the book, at £90, is expensive.

My criticisms do not imply that the book is not good and not worth purchasing. The compilation is a valuable, detailed documentation of case studies and includes introductory paragraphs in several chapters. Every geology library should have a copy, and the book will be of use to graduate students, postdoctoral fellows, and teachers/professors of geochemistry and petrology.

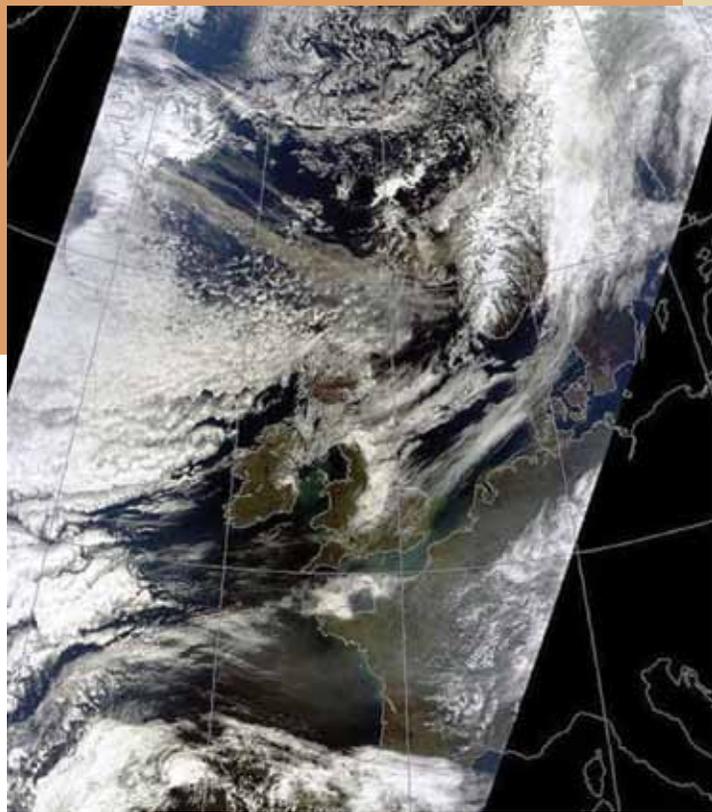
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\* Coltorti M, Grégoire M (eds) (2009) *Metasomatism in Oceanic and Continental Lithospheric Mantle*. Geological Society Special Publication 293, hardback 361 pp; £90.00 for non-members; £45.00 for members

# Sampling the Volcanic Ash from the Eyjafjallajökull Volcano, Iceland — A Personal Account

Sigurdur Reynir Gíslason\*  
and Helgi Arnar Alfredsson\*

The eruption of the Eyjafjallajökull volcano started on 20 March 2010. The first phase of the eruption was effusive, producing lava flows on the glacier-free part of the volcano, with insignificant volcanic ash fallout. In the early morning of 14 April 2010, the eruption entered an explosive phase, ejecting volcanic ash to heights in excess of 9 km (FIG. 1) and causing major disruption to European air travel. The explosive phase of the eruption took place within the summit caldera under a 200–300 m thick ice cover. The meltwater and steam at the glacier-covered eruption site chilled the magma, causing it to disintegrate explosively and producing fine-grained volcanic ash particles that were able to travel long distances. *Jökulhlaup*, floods of meltwater, reached the lowlands around the volcano at about noon on 14 April. The ash-loaded eruption plume was deflected to the east by westerly winds, and ash started to fall in southeastern Iceland on 14 April. The next day, the eruption plume reached mainland Europe (FIG. 2). Most of the erupted material was in the form of volcanic ash. The ash was sent into the southeasterly moving jet stream, which then carried the ash over Europe, into one of the busiest airspaces in the world.



**FIGURE 2** MODIS image of the ash cloud (darker grey than ordinary clouds) at 11:39 GMT on 15 April. REPRODUCED WITH PERMISSION FROM NEODAAS/ UNIVERSITY OF DUNDEE



**FIGURE 1** The plume from Eyjafjallajökull, 15:20 local time (= GMT), 14 April 2010. PHOTO ARNI SÆBERG

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**FIGURE 3** Heading into the plume shortly after noon, April 15. Helgi is the driver of the first car. PHOTO COURTESY OF ÓMAR ÓSKARSSON

Volcanic ash ingested by jet engines may lead to engine failure. Large amounts of air are sucked into jet engines during combustion. Very fine volcanic ash particles sucked into a jet engine melt at about 1100 °C, fusing onto the blades and other parts of the turbine, which operates at about 1400 °C<sup>1</sup>. Moreover, volcanic ash is highly abrasive, and therefore, forward-facing surfaces of an airplane (e.g. cockpit windows) are likely to be damaged. Some ash particles passing through the engines may enter the interior of the plane via the ventilation ductwork<sup>1,2</sup>. To prevent such damage, the controlled airspace of many European countries was closed to passenger flights, resulting in the largest air-traffic shutdown since World War II<sup>3,4</sup>. The closures caused millions of passengers to be stranded in Europe and across the world. After an initial continuous shutdown over much of northern Europe from 15 April to 23 April, airspace was closed occasionally in parts of Europe during the following weeks.

## PERSONAL EXPERIENCE

I received a phone call around 6 AM on 14 April informing me that the eruption was in an explosive phase and that floods were expected in the vicinity of the volcano. I packed gear for sampling water and ash, and a few hours later, headed for the volcano with Helgi Alfredsson, one of my PhD students. It was a race against time, because floods were on the way and we needed to get east of the rivers before their arrival. We were the last ones to pass over the bridge before the road was washed away by the flood. We collected several samples from 3 floods on 14 April. Around midnight we learned that the eruption would close European air space, and we were asked to sample the fallout from the ash plume in eastern Iceland. Information about the volcanic ash was badly needed, and helicopters could not come close enough to the eruption. We had to drive into the ash plume. The information needed included mineralogical and chemical composition, the identity of metal-salt and acid-salt coatings on the ash, and grain-size distribution. These parameters would be fed into volcanic plume distribution models. In the morning of 15 April, we drove east into the plume, followed by two cars carrying local police and journalists (Fig. 3). We sampled the southern edge of the plume 50–60 km east of the summit crater. These samples were immediately driven back out of the plume by Helgi and the local police to a helicopter that brought them to the laboratories in Reykjavik for chemical analysis, grain-size analysis, and dry storage (ash is hygroscopic, that is, it takes up water from the air, causing alteration).

I headed farther into the plume followed by a journalist. It was absolutely dark in the middle of the fallout zone at 12:45 PM (Fig. 4). Once I got out of the car, I was expecting to sense fallout on my helmet, but nothing could be heard. It was perfectly quiet, and there was neither wind nor rain. When I was in front of the car, I could see in the light column from the headlights that the air was saturated with very fine-grained ash, floating like greyish flour in the air. This fine-grained ash

prevented light from reaching the ground. It turned out that about 7 wt% of the ash was less than or equal to 2.6 micrometers ( $\mu\text{m}$ ) in diameter and that more than 20% of the mass of the ash was less than or equal to 10  $\mu\text{m}$  in diameter. This ash was able to travel long distances—all the way to Europe. I sampled the ash, drove on until we started to see light again, and sampled the northeastern edge of the plume. On the way back through the ash, the wind speed increased, blowing most of the ash off the road, and once I was out of the fallout zone, it started to rain. We were lucky to have collected pristine, dry ash samples across the plume.

On Friday morning, 16 April, when I returned to my laboratory at the university in Reykjavik, I was amazed – journalists were there from all over the world, the phone never stopped ringing, and all my colleagues were doing their best to answer questions about the eruption: When will it be over? Why is there so much ash? Is the ash harmful to health? I was very flattered in the beginning; you fight for attention for your research for years, and then all of a sudden you have too much of it. There were several pictures of us sampling the ash in the Icelandic morning paper, and over the weekend, we saw them on the covers of some of the major newspapers of the world. I read in *Der Spiegel* that I was 52 years old and that I was scared to death going into the plume<sup>5</sup>. After the first days of too much attention, I gave up, unplugged the phones, and ignored my e-mails for a while. I worked with my group on the ash, determined the composition of the floodwaters and the pollutants carried by the first rain on the ash in the vicinity of the volcano, started controlled laboratory experiments on the water/ash, and seawater/ash interactions, and began to explore chemical reactivity. And for a more thorough characterization of the nanoparticles and their surface coatings, we sent samples to Susan Stipp at the NanoGeoScience Centre in Copenhagen.



**FIGURE 4** Sampling in the middle of the plume at 12:45 PM, 15 April, using the headlights of the car. The photographer pointed the lens out of the plume. I am mostly covered to avoid getting ash on my skin. Some ash has metal-salt and acid-salt coatings, which may be toxic. I wore a skimo helmet that fits tightly and has a filter over the nose and mouth to prevent breathing the submicrometer-sized particles. PHOTO COURTESY OF ÓMAR ÓSKARSSON

## REFERENCES

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- 2 Durant AJ, Bonadonna C, Horwell CJ (2010) Atmospheric and environmental impacts of volcanic particulates. *Elements* 6: 235-240
- 3 BBC: Row grows over airspace shutdown costs, 22 April 2010. [http://news.bbc.co.uk/2/hi/uk\\_news/8636461.stm](http://news.bbc.co.uk/2/hi/uk_news/8636461.stm)
- 4 *The Sydney Morning Herald*. 18 April 2010. Qantas cancels flights for a third day" <http://www.smh.com.au/travel/travel-news/qantas-cancels-flights-for-a-third-day-20100418-slv5.html>. Retrieved 18 April 2010. <http://www.smh.com.au/travel/travel-news/qantas-cancels-flights-until-tuesday-afternoon-20100418-slv5.html>
- 5 *Der Spiegel*. 19 April 2010, "Müder alter Mann" 16/2010, page 110-112

## NICE DAY OUT FOR A MATERIALS SCIENTIST

A recent visit to the Isle of Mull, off western Scotland (*Elements* 6: 198), took me to the type localities of three minerals, mullite, tobermorite and kilchoanite. All three are rare in Nature but two are of enormous importance in the materials science world. Mullite is a close relative of sillimanite but with variable stoichiometry,  $Al_{4+2x}Si_{2-2x}O_{10-x}$ , where  $x$  is  $\sim 0.2-0.6$ . It was first identified in 1924, during experimental work on the system  $Al_2O_3-SiO_2$  by N.L. Bowen and J.W. Greig (no less) at the Geophysical Lab, on the  $3Al_2O_3 \cdot 2SiO_2$  composition. They considered it would occur naturally and obtained samples of glassy buchites, formed by fusion of argillaceous xenoliths in basaltic sills, from Seabank Villa on Mull<sup>1</sup>. They found needles of their new phase embedded in glass and were able to separate them by dissolving the glass overnight in cold HF. The name 'mullite' was proposed by Bowen, Greig and E.G. Zeis in the same year.

Mullite is an extremely widely employed refractory substance with a melting point of up to 1830 °C, depending on composition. Typing 'mullite' into Web of Science raised 4163 papers, currently receiving nearly 3500 citations per year. The people of the Hesse region of Germany unwittingly established its use in high-temperature ceramics in the 15<sup>th</sup> century when they developed a way of making refractory crucibles by heating mixtures of very pure kaolinite and quartz to  $>1100$  °C, essentially the reaction studied by Bowen and his colleagues 500 years later. 'Hessian crucibles' were much in demand by early alchemists and were traded all over Europe, even reaching the distant colony in Virginia. Today mullite has many high-tech uses, including optical systems and linings in aircraft engines and on the surfaces of space vehicles. Sintered, mullite-based ceramics can be formed into complex shapes, for example bicycle-style chains that can be used to move items inside furnaces at high temperatures. Doped mullite can be used as a laser material.



Kilfinichen Bay, Isle of Mull, near Seabank Villa, with the type locality of mullite in the foreground

The pretty village of Tobermory, home to the mineral tobermorite, roughly  $Ca_3Si_6O_{16}(OH)_2 \cdot nH_2O$ , is 27 km north of Kilfinichen Bay. Tobermorite is not quite such a high-flier as mullite, but WoS still leads you to 485 articles and 800 citations in 2009. Its citation rate is increasing exponentially. The mineral was discovered in 1880, in amygdaloids in basalt, by a man who was, in every sense, a giant of Scottish mineralogy, Matthew Forster Heddle. Professor of Chemistry at the University of St. Andrews, he tramped single-mindedly around Scotland collecting minerals, which he catalogued, analysed and described, producing hundreds of drawings based on optical goniometry. He had tremendous physical strength, carried hammers up to 28 lbs in weight and thought nothing of using dynamite to reveal the 'hidden treasures' inside rocks. Tobermorite is a cement phase, a very complicated material, with a range of imperfectly understood polymorphs and chemical variants. It is a crystalline product of gentle heating of the poorly crystalline calcium silicate hydrates that are the main binding material in Portland cement, so its performance is crucial where cements are used in warm environments, such as petroleum reservoirs and radwaste

1 There is more literature research underlying these little articles than you might think, and I'm greatly indebted to Ross Angel, of Virginia Tech, for running down an American reference confirming this exact locality.



Tobermory



Tobermorite, Concepcion del Oro Mine, Zacatecas, Mexico. Sample (3.9 × 2.3 × 1.9 cm) MARTIN ZINN. PHOTO COURTESY WWW.IROCKS.COM



Kilchoan. The hills are part of the Ardnamurchan ring complex.

repositories. It forms in the altered rinds on glass radioactive waste-forms and at interfaces between cement grouts and clay, and can be used for its ion-exchange properties, including removal of the radionuclides  $^{137}Cs$  and  $^{90}Sr$  from liquids.

From Tobermory a half-hour ferry trip north across the Sound of Mull brings us to the tiny village of Kilchoan, the most westerly village of mainland UK. Kilchoanite,  $Ca_6(SiO_4)(Si_3O_{10})$ , is the Cinderella of our three minerals, with a mere 17 articles and 110 citations since its identification as a mineral in 1961 by S.O. Agrell and P. Gay from Cambridge. Like tobermorite it is a phase related to cement, and like mullite it was discovered first as a synthetic compound, by one of the most enduring contributors to cement science, Della M. Roy of Penn State. In 1958 she synthesised a phase in the system  $CaO-Al_2O_3-SiO_2-H_2O$ , at about 800 °C and 100 MPa, that she called phase Z. Agrell and Gay identified the same phase, using XRD, in limestones metamorphosed by gabbros of the Ardnamurchan ring complex.

Mullite, tobermorite and kilchoanite provide a fascinating glimpse of the interweaving of mineralogy and materials science. And the tea-rooms and pubs of Tobermory are highly recommended!

**Ian Parsons**  
University of Edinburgh, UK

2010

**September 13–15** 89<sup>th</sup> Società Italiana di Mineralogia e Petrologia (SIMP) Meeting, Ferrara, Italy. Details: Lorenza Fascio; e-mail: segreteria@socminpet.it; web page: www.socminpet.it

**September 13–16** Reunión Sociedad Española de Mineralogía (SEM), Madrid, Spain. Web page: www.ehu.es/sem/congreso/CONGRESO.HTM

**September 19–21** Alkaline Rocks: Petrology, Mineralogy, Geochemistry – Conference Dedicated to the Memory of J. A. Morozewicz, Kiev, Ukraine. Details: Vladimir Khomenko (vladkhom@hotmail.com) and Marek Michalik (marek.michalik@uj.edu.pl); web page: www.ptmin.pl/alkalinerocks

**September 19–22** Jahrestagung der Deutschen Mineralogischen Gesellschaft (88<sup>th</sup> Annual Meeting of the DMG), Münster, Germany. Web page: www.conventus.de/dmg2010

**September 27–30** The 1<sup>st</sup> Conference on Contemporary Problems of Geochemistry (organized by the Mineralogical Society of Poland), Kielce, Poland. E-mail: geochemistry2010@ujk.edu.pl; web page: www.ujk.edu.pl/geochemistry2010

**October 4–8** Introduction to Secondary Ion Mass Spectrometry in the Earth Sciences, GFZ Potsdam, Germany. Web page: www.dmg-home.de/kursprogramm.html

**October 14–17** Lamprophyres and Related Mafic Hypabyssal Rocks:

Current Petrological Issues, Sudetes, Poland. Web page: www.ing.uni.wroc.pl/~lamprophyres2010

**October 25–29** 23<sup>e</sup> Réunion des Sciences de la Terre (RST) FFG-SFG-SFMC Earth Sciences Biennial Meeting, Bordeaux, France. Web page: www.rst2010.epoc.u-bordeaux1.fr

**October 31–November 3** Geological Society of America Annual Meeting, Denver, CO, USA. E-mail: meetings@geosociety.org; web page: www.geosociety.org/meetings/index.htm

**November 2010** EURISPET: Experimental Petrology and Rock Deformation, Zürich, Switzerland. Details: Peter Ulmer, e-mail: peter.ulmer@erdw.ethz.ch; web page: www.eurispet.eu

**November 19–20** Eighth Swiss Geoscience Meeting, Fribourg, Switzerland. Web page: geoscience-meeting.scnatweb.ch

**December 11–12** MSA and GS Short Course: Diffusion in Minerals and Melts. Napa, CA, USA. Web page: www.minsocam.org/MSA/SC

2011

**May 25–27** Geological Association of Canada /Mineralogical Association of Canada Annual Meeting, Ottawa, Canada. Web page: www.gacmacottawa2011.ca

**June 21–24** The Mineralogical Society's Annual Meeting: Frontiers in Environmental Geoscience, University of Aberystwyth, Wales, UK. Details: N.

Pearce, e-mail: njp@aber.ac.uk; web page: www.minersoc.org/pages/meetings/frontiers-2011/frontiers-2011.html

**June 26–July 1** Euroclay 2011, Antalya, Turkey. Web page: www.euroclay2011.org

**July 10–20** EMU School – Bulk and Surface Structures of Layer Silicates and Oxides: Theoretical Aspects and Applications, Rome, Italy. Web page: www.univie.ac.at/Mineralogie/EMU

**July 30–31** MSA and GS Short Course: Applied Mineralogy of Cement and Concrete, Trondheim, Norway. Details: Maarten A.T.M. Broekmans, e-mail: maarten.broekmans@ngu.no; webpage: www.minsocam.org/MSA/SC

**August 8–12** 74<sup>th</sup> Annual Meeting of the Meteoritical Society, Greenwich, England. Details: Gretchen Benedix, e-mail: greb@nhm.ac.uk; web page: http://www.meteoriticalsociety.org

**August 14–19** 2011 Goldschmidt Conference, Prague, Czech Republic. E-mail: helpdesk@goldschmidt2011.org, web page: www.goldschmidt2011.org

**August 22–26** 25<sup>th</sup> International Applied Geochemistry Symposium (IAGS 2011), Rovaniemi, Finland. Web page: www.iags2011.fi

**September 25–30** The Clay Minerals Society Annual Meeting, Lake Tahoe, Nevada. www.clays.org

**October 9–12** Geological Society of America Annual Meeting, Minneapolis MN USA. E-mail: meetings@geosociety.org; web page: www.geosociety.org/meetings/index.htm

2012

**May 28–30** Geological Association of Canada /Mineralogical Association of Canada Annual Meeting, St. John's, Newfoundland, Canada. Web page: www.gac.ca/activities

**August** 2012 Annual Meeting of the Meteoritical Society, Cairns, Queensland, Australia. Details: Trevor Ireland, e-mail: trevor.ireland@anu.edu.au; web page: www.meteoriticalsociety.org

**September 17–20** Geoanalysis 2012, Búzios, Brazil. Web page: www.ige.unicamp.br/geoanalysis2012

**November 4–7** Geological Society of America (GSA) Annual Meeting, Charlotte, NC, USA. Web page: www.geosociety.org/meetings

In order to make room for the timely Travelogue article on pages 269 and 270, the calendar has been shortened to include only upcoming meetings of the participating societies. Our regular calendar will return with the next issue. Please check the meeting calendar maintained by Andrea Koziol at <http://homepages.udayton.edu/~koziolam/meetings.html>.

PARTING QUOTE

The trouble with the world is that the stupid are cocksure and the intelligent full of doubt.

BERTRAND RUSSELL

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CALL FOR PAPERS

FRIENDS OF MINERALOGY SYMPOSIUM  
MINERALS OF CALIFORNIA  
12 FEBRUARY 2011

The thirty-second annual Friends of Mineralogy Symposium will be held in conjunction with the Tucson Gem Mineral Show and will take place on Sunday, 12 February 2011. It is sponsored by the Friends of Mineralogy, the Tucson Gem and Mineral Society, and the Mineralogical Society of America. The symposium theme is the same as the show theme: "Minerals of California". Presentations on descriptive mineralogy, paragenesis, classic and new locations, and related subjects are welcome. An audience of amateur and professional mineralogists and geologists is expected.

Anyone wanting to present a paper should submit a 200–300 word abstract to Julian C. Gray, Tellus Science Museum, P.O. Box 3663, Cartersville, Georgia, 30120; Email: [juliang@tellusmuseum.org](mailto:juliang@tellusmuseum.org); Phone: 770-606-5700, ext. 415; Fax: 770-386-0600.

Presentations will be twenty minutes in length, followed by a period of questions. Abstracts must be submitted by 1 October 2010.