History & Heritage of Glass
Group
a special interest group of the SGT

Monday 5th September 2011 *Seminar at*
the Society of Glass Technology Annual Conference
at the University of Oxford,
commemorating the 300th anniversary of the birth of
Mikhail Vasilievich Lomonosov

Abstracts

09:50 Mikhail V. Lomonosov (1711-1765): "To Glass All His Labour Was Applied."
Tatiana Moiseeva

10:40 Refreshments

11:00 Russian Glass Chemistry: From Lomonosov to Shultz
Natalia Vedishcheva
11:40 The 17th century glasshouse at Shinrone, Co. Offaly, Ireland
Sarah Paynter
12:20 Roman glass recycling on a grand scale: excavations at St Algar's Farm, Somerset
Ceri Lambdin

13:00 Lunch

14:00 Pliny's lost glass; the search for flexible glass and the formation of the research agendas in early modern Europe
Vera Keller
14:40 Looking for primary Roman glass production in the Western Mediterranean
Dieter Brems
15:00 Trade routes across the Mediterranean: A Sr/Nd isotopic investigation of Roman colourless glass
Monica Ganio

16:00 Refreshments

16:20 Glass coatings on stones of copper smelting furnaces
Rainer Werthmann
17:00 General Discussion

17:40 End of Seminar

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Mikhail V. Lomonosov (1711-1765): "To Glass All His Labour Was Applied."
Tatiana Moiseeva

Abstract:
Mikhail Lomonosov (1711-1765), the scientist, technologist, poet, artist, the first native Russian academician played very important role in Russian culture. Thank to his activity Russia came in the common European cultural world of 18 c. The famous Russian poet Alexander Pushkin called Lomonosov 'the first Russian University'. Lomonosov was the organizer of the first scientific and educational Chemical laboratory, Moscow University, the first factory of color glasses in Russia. By the end of his life Mikhail Lomonosov had been the chief of all Scientific Departments, Gymnasium and the University of the Academy of Sciences. His prestige was considerable in Russia, and his scientific works were known abroad, they published in several European scientific journals. Lomonosov corresponded with many famous European scientists. Leonard Euler supported him. The first native Russian academician became the honor member of Academy of Arts, Academy of Sciences of Bologna, the Royal Swedish Academy. His biography, his indefatigable nature and versatile activity exceeded the limits of ordinary life. Many volumes wrote about Mikhail Lomonosov, his life. There are a lot of legends, far-fetched stories about him and his actions. Mikhail Lomonosov was unusual figure in Russian society of 18c. His ambition was to educate himself to join the learned men on whom the tsar Peter I the Great was calling to transform Russia into a modern nation. Lomonosov was born in a small coastal village near Arkhangelsk in North of Russia in family of prosperous fisherman and trader. In spite of common Russian traditions he could get the best education in Russia and Europe. He knew several languages (8-20, according different information). He was the reformer of Russia languages and introduced the living scientific terms in it. Lomonosov wrote main of his scientific works in Latin and at the same time he was the first who began to read and published scientific works in Russian. It was very important step for adaptation modern European scientific knowledge in Russia. His main scientific interests of Lomonosov were connected with physical and chemical themes. the dominant ideas of his scientific work set in «276 Notes on Corpuscular Philosophy and Physics». Appointed a professor by the Academy in 1745, he translated Christian Wolff's Institutiones philosophiae experimentalis («Studies in Experimental Philosophy») into Russian and wrote, in Latin, important works on the Meditationes de Caloris et Frigoris Causa (1747; «Cause of Heat and Cold»), the Tentamen Theoriae de vi Aëris Elastica (1748; «Elastic Force of Air»), and the Theoria Electricitatis (1756; «Theory of Electricity»). In 1745 he was elected first of

native Russian full professor of chemistry at the St.-Petersburg Academy. In 1748 Lomonosov opened the Chemical laboratory of Academy of Sciences; it then began a prodigious amount of his activity. He began to read the lectures on chemistry in Russian for the students connecting with the training. At the same time he passionately undertook many tasks and recorded in three years more than 4,000 experiments, the results of which enabled him to set up a coloured glass works and to make mosaics with these glasses. Anxious, he wrote "Discourse on the Usefulness of Chemistry", 1751 and in 1752 an Introduction to the physical chemistry course that he was to set up in his laboratory. The theories on the unity of natural phenomena and the structure of matter he set forth in the discussion "Origin of Light and Colours", 1756. Lomonosov combined his poetic gifts with his scientific engagement to produce scientific poetry. the "Ode" to Emperess Elizabeth and "Letter to I.I. Shuvalov Concerning the Usefulness of Glass",1752; celebrated his fruitful union of abstract and applied science. "A Letter on the Uses of Glass" is the first Russian literary work to hail Copernicus's heliocentrism and get metaphors to portray the of scientific ideas of the kind advanced by Huygens, Newton. This poem finished the words: "To Glass, all my Labour was Applied."

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The 17th century glasshouse at Shinrone, Co. Offaly, Ireland
Sarah Paynter

Abstract:
In the late 16th century, glass workers from Lorraine and Normandy came to England, bringing with them a new glass-working tradition. The glass was a better quality than the English medieval variety, and analyses have since shown that it had a different composition, termed high-lime, low-alkali (HLLA) glass. In 1615 the use of wood fuel in glass-making in England was prohibited but in Ireland restrictions were not introduced until 1641. Members of the French glassmaking families left England for Ireland and wood-fired glass furnaces flourished there during the first part of the 17th century. Remarkably, a wood-fired glasshouse complete with part of its superstructure, dated to the first half of the 17th century, survives at Shinrone, County Offaly, Ireland. Two seasons of excavation have been carried out at the glasshouse by Caimin O'Brien and Jean Farelly, who have also researched the documentary evidence relating to glasshouses in the region. The glass assemblage has been studied typologically by Dr Hugh Wilmott of Sheffield University.

This presentation will describe the fragments of glassworking waste, crucibles and furnace recovered in the excavations, plus a number of surface finds from the nearby site of a contemporary furnace, at Glaster, Lusmagh. This glassworking waste plus a selection of the glass from the site were analysed at English Heritage, Fort Cumberland. The results were used to identify which glass products from the assemblage were made at the site, and which were not, demonstrating that both window and vessel glass, including early bottles, were produced at Shinrone. The Glaster furnace produced a similar glass but the composition was subtly different, allowing glass from these two sites to be distinguished. The results also provide information on the raw materials used (likely to be ash from oak wood and sand), the temperatures achieved in the furnace (in the region of 1300-1350°C) and the refractory materials used in the construction of the furnace and crucibles. Shinrone offers a unique opportunity to investigate the technological developments introduced by French glassworkers in late 16th century England and subsequently in Ireland as so much more survives than on English sites.

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About the Presenting Author:
Dr Sarah Paynter is a materials scientist who worked in industry for several years before completing a DPhil in archaeological science. She has worked for English Heritage for 12 years researching a wide range of archaeological materials, particularly from high temperature processes.

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Roman glass recycling on a grand scale: excavations at St Algar's Farm, Somerset
Ceri Lambdin

Abstract:
St Algar's Farm on the Somerset/Wiltshire border is a place steeped in history. A Medieval chapel, referenced in the twelfth century, a post-Medieval farm and now, no longer a working farm but a hive of local industries.
The site's history has now been confirmed to stretch back to the Roman and possibly Iron Age periods. A personal research project that started in late 2009 to investigate the little known Romano-British villa site in one of the neighbouring fields has thrown up unexpected results.
A geophysical survey in 2010 confirmed the existence of a Romano-British villa and alongside it other settlement activity including a potential mausoleum/temple. An evaluation excavation later in the same year produced evidence of occupation throughout the Roman period, confirming the geophysics results.
In addition to the usual artefacts found at Romano-British villa sites, a large quantity of glass, glass working waste and glass-melting crucible fragments were recovered. These have been identified by Dr Rachel Tyson, a glass specialist, as being evidence of late-Roman (fourth century) glass working at the site.
There are around twenty-two known locations for glass working in Roman Britain, all in either military or urban locations and none in the south-west. The villa at St Algar's Farm is the first identifiable rural glass working site.
This presentation will demonstrate the archaeological evidence for glass working at the site and its context within the site itself along with a comparison of the evidence from other Romano-British glass working locations.

About the Presenting Author:
Ceri Lambdin, Director of the St Algar's Project, graduated from the University of Bristol in 2006 with a first class degree in Archaeology after studying part-time for 7 years while working full-time in the IT industry. She has been Secretary of the Bath and Camerton Archaeological Society for 11 years and is now spending all of her spare time running the St Algar's project.

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Pliny's lost glass; the search for flexible glass and the formation of the research agendas in early modern Europe

Vera Keller (University of Oregon, USA)

Abstract:
For those seeking to rediscover the glories of the ancient world in early modernity, one frequently retold story encapsulated the possibilities and dangers facing invention. This was the story of flexible glass, an amazing substance, which, according an ancient Roman tale, had been discovered during the reign of the infamous Emperor Tiberius. According to legend, Tiberius murdered its inventor and destroyed his workshop, lest the new substance reduce the value of precious metals. "Who would not hate such a savage murderer and destroyer of art and artisan, and who reading of the affair will not boil with rage?" asked one outraged chemical writer in 1611. As other seventeenth-century commentators remarked, glass was the most perfect invention of mankind; its fragility was its only imperfection. Flexible glass thus not only presented a fantasy of perfectly restoring a decayed, ancient Rome to its pristine grandeur, but furthermore of building a newly resilient world which could never again be shattered. The story of its loss dramatized how such dreams might be dashed by private interest and secrecy - on the part of both Tiberius and the inventor, who did not share his procedure. Flexible glass was both an avidly pursued substance itself in the seventeenth century, and the story of its loss helped to shape how the pursuit of desired objects in general was conducted. This paper will recreate the search for this ancient mythical material across seventeenth-century Europe. In so doing, I will discuss what specific chemical investigations the pursuit of flexible encouraged, and more generally, how thinking about the relationship of ruler, subject, and invention helped shaped plans for the advancement of knowledge at large.

About the Presenting Author:

Vera Keller (AB Harvard, PhD Princeton, 2008) is Assistant Professor of History at the University of Oregon, USA. She is a historian of science who studies the history of alchemy and scientific experimentation in Europe and the Ottoman Empire during the Renaissance. She wrote her dissertation on a fabled Renaissance alchemist, "Cornelius Drebbel (1572-1633): Fame and the Making of Modernity." She is currently a Mellon Post Doctoral Fellow (2010-12) at USC's Huntington Early Modern

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Studies Institute, where she is pursuing her next project, "The Desiderata List: Collecting the Future in the Early Modern Past." She will join the Clark Honors College faculty on campus in Fall 2011

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Looking for primary Roman glass production in the Western Mediterranean

Dieter Brems, Patrick Degryse, Monica Ganio & Sara Boyen
(Katholieke Universiteit Leuven, Belgium)

Abstract:
Pliny the Elder's Natural History has been cited numerous times in studies of ancient natron glass production. Pliny describes the production of glass using sand from the beach near the mouth of the river Belus and the coastal strip between Cuma and Liternum near the river Volturno. After giving these precise locations for the source of glassmaking sands in the Levant and Italy, Pliny mentions that 'throughout the Gallic and Spanish provinces even, we find sand subjected to a similar process', thus indicating that glass was made from raw materials in France and Spain. However, no direct archaeological evidence has been found to support primary production in these regions. Furthermore, the suitability of these sands has never been evaluated.In this study we investigate the possible existence of a Roman primary glass industry in the western Mediterranean, based on the occurrence of suitable sand raw materials. 185 beach sands from Spain, France and Italy are evaluated for their suitability for glass production by calculating the composition of hypothetical natron glasses made from these sands and comparing them to the composition of Roman natron glass.The results show that suitable glassmaking sands are far from common. Only a very limited number of the analysed sands would produce a glass with major and minor elemental compositions within the ranges or Roman imperial natron glass. The rest of the sands are unsuitable for glass production in their present form, the determinant factors often being the insufficient SiO2, the high Al2O3 and Fe2O3 levels and either too low or too high CaO contents. The sands which would produce glasses of acceptable composition are all mainly derived from the recycling of older sedimentary successions. This reflects the importance of polycyclic chemical and mechanical weathering in the maturation of sediments. The necessary amount of CaO is brought to the sand either through calcareous fragments from minor (but important) limestones or marls in the local hinterland, or through contributions of shell fragments naturally included in the sand.If sands contain too little CaO to produce a stable glass, pieces of shell or limestone can be added to the glass batch, as was already suggested by Pliny the Elder. Therefore a second calculation was performed in which the CaO contents of the hypothetical glasses were raised to the average CaO content of Roman glass, to model this deliberate addition of extra lime. Although the quality of most examined sands is improved, very few samples could be brought to within compositional ranges of Roman glass for all main and minor elements.By

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calculating the composition of hypothetical glasses produced from modern beach sands, we were able to define a few limited areas where suitable sand raw materials would have been available to the Roman glassmaker. This allows us to make some suggestions about the possible locations of primary Roman glass production in the western Mediterranean.

About the Presenting Author:
Dieter Brems is a researcher at the Katholieke Universiteit Leuven, Belgium, working in the Department of Earth and Environmental Sciences.

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Trade routes across the Mediterranean: A Sr/Nd isotopic investigation of Roman colourless glass

Monica Ganio

Abstract:
Trade by sea was quite common during Roman times, as attested by the numerous shipwrecks found in the Mediterranean. Cargos were usually mixed, often composed of stone, amphorae with different contents or tableware ceramics, together with variable quantities of glass. It is less common to find a cargo mainly composed of glass. In this study major elements and Sr-Nd isotopic analysis is performed on 33 colourless glass fragments from two Roman shipwrecks discovered in the Northern Mediterranean Sea. The Iulia Felix, found out off the coast of Grado (northeastern Italy) and dated to the first half of the 3rd century AD, shows a cargo mainly composed of amphorae together with a total of 140 kg of glass (cups, bottles and plates). The Ouest-Embiez 1, wrecked off the coast of Provence (southern France), is dated to the end of the 2nd-beginning of the 3rd century AD and has a cargo mainly composed of glass, with 18 tons of raw glass, and about 1800 pieces ranging from cups to window glass. Two compositional groups are defined based upon the major elements analysis, suggesting the use of different raw materials, and possibly the production of the glass samples in two separate factories. This conclusion is supported by the presence of different decolourizing agents showing the use of two different glass recipes. The first group, which shows low levels of Ca, Al, K, Ba, Ti and P, is made with a more quartz-rich (pure) sand, and Sb as decolorising agent. Its composition is similar with the 'group 1' of Jackson (2005) or with the 'group 4' of Picon and Vichy (2003). Raw glass and 'high status' dishware (cups and plates) belong to this group. The second group is produced with a less pure sand, rich in Ca and Al, and it is similar in composition with the 'group 3' of Nenna (1997) but with a higher content of MnO (>1%). Mn, the decoloriser, is positively correlated with Ba and Sr, suggesting the introduction of those three elements through a common source, probably wad or psilomelane. Sr–Nd isotopes are promising indicators for provenancing geological resources used as raw materials in glass manufacturing. The Sr isotopic composition, a proxy for the lime source, of the glass samples in analysis corresponds to the present-day seawater signal (87Sr/86Sr ~ 0·7092), suggesting the use of beach sand as lime source. The two compositional groups are confirmed by the Sr content vs. 87Sr/86Sr plot. The group decolorised by Sb has a higher isotopic signature (87Sr/86Sraverage=0·709045±0·000041) together with a lower content of Sr (268–394 μg/g), while the other group shows a higherall main and minor elements. By calculating the composition of hypothetical glasses produced from modern beach

sands, we were able to define a few limited areas where suitable sand raw materials would have been available to the Roman glassmaker. This allows us to make some suggestions about the possible locations of primary Roman glass production in the western Mediterranean. History & Heritage: Russian Glass History 27 content of Sr (458–551 µ g/g) associated with a lower Sr isotopic signature (87Sr/86Sra verage=0 ·708808±0 ·000043). This represents an unusual situation, since it is commonly accepted that beach shells, rich in aragonite, should have a higher content of Sr than limestone, together with a Sr isotopic signature very close to the modern seawater value. The anomaly can be explained by the addition of Sr through a separate source than the sand, characterized by a low Sr isotopic composition. This source introduces also the decolorizer Mn (associated with Sr and Ba). The Nd isotopic composition is typical of the heavy non-quartz fraction in the silica raw material. The Nd isotopic analysis (in progress) and the comparison with ranges of isotopic characteristics of sands from around the Mediterranean, will help provenance the glass samples of the two Roman shipwrecks and recreating their commercial trade routes.

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Glass coatings on stones of copper smelting furnaces
Rainer Werthmann

Abstract:
In archaeological experiments at the university of Kassel, Germany, the copper smelting process in furnaces of the type used in Timna, Israel, and Fenan, Jordan, was reproduced. The materials used were close in composition to those found at the original sites: sandstone for the furnace, oxidic/ carbonatic copper ore, charcoal, iron ore as slag-forming additive. Special attention was paid to the glaze layers formed inside the furnaces containing evaporated constituents of charcoal ash, silica from the stones and traces of copper. The glass layers were investigated by scanning electron microscopy, their composition being determined at various points by electron beam microprobe. From these data, a detailed mechanism of formation could be reconstructed. The variation of the composition as a function of the temperature of formation could be shown.

References:

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