Thursday 8th 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

09:00 Glass: Colouring our view of Life
John Parker
10:00 Glass of the Alchemists: A Retrospect on an Exhibition at the Corning Museum of Glass 2008
Dedo von Kerssenbrock-Krosigk

10:40 Refreshments

11:00 Mikhail Lomonosov and Erik Laxman and the Dawn of Glass Technology.
Kaj Karlsson
11:40 The Classic Texts of Glass Technology
Michael Cable
12:20 The 18th century arcana of William Stephens
Carlos Queiroz

13:00 Lunch

14:00 Experimental Reproduction of Iron Age Scottish Glass Beads: Linking Analytical Techniques to the Production of Replica Artefacts
Martina Bertini
14:40 They went to larn 'em - British glassmakers help to establish Japan's first Western-style glassworks, 1873-1884
Sally Haden

15:20 Refreshments

15:40 Further Archaeological Work at the Site of the Nailsea Glassworks New House Cone
Andrew Smith
16:20 Developments of Siemens regenerative and tank furnaces in Saint-Gobain in the XIXth century
Marie-Helene Chopinet

17:00 End of Seminar

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Glass of the Alchemists:
A Retrospect on an Exhibition in 2008 at the Corning Museum of Glass

Dedo von Kerssenbrock-Krosigk

Abstract:
In 2008, an exhibition at The Corning Museum of Glass was dedicated to the "Glass of the Alchemists." It focused on 17th and early 18th century glass production in Central Europe and on the British Isles, when new glass qualities—e.g. lead crystal in England, Kristallglas and gold ruby glass in Central Europe—emerged almost simultaneously. The principal argument of the exhibition and its accompanying catalogue was that alchemy provided much of the knowledge that glassmakers required to succeed in this technological revolution. Fairly recent studies by historians of science show that alchemy should not be merely considered as a vain and preposterous quest for making gold, but rather as a material science that preceded chemistry and that was at times highly successful in its endeavours. A short presentation and summary will be provided, as well as some information on further research in this field (as far as it has come to the contributor's attention). Finally, the outline for a new exhibition will be presented. It is due to take place in Dusseldorf, Germany, probably in 2013, and it will explore the interdependencies of Art and Alchemy beyond the realm of glassmaking.

About the Presenting Author:
Dedo von Kerssenbrock-Krosigk is head of the Glasmuseum Hentrich, Stiftung museum kunst palast, in Dusseldorf, Germany. After receiving his doctorate from Humboldt University, Berlin, he worked at the Bröhan-Museum—a museum specialized in Art Nouveau and Art Déco decorative arts—in Berlin 1998–2003. From 2004 until 2008, he was curator of European glass at The Corning Museum of Glass, Corning, New York. As such, he was responsible for the museum's collections from the Middle Ages to about 1900. His major project in Corning was the exhibition "Glass of the Alchemists" and its accompanying publication.

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Mikhail Lomonosov and Erik Laxman and the Dawn of Glass Technology
Kaj H. Karlsson (Åbo Akademi University, Finland)

Abstract:
Mikhail Lomonosov and Erik Laxman and the Dawn of Glass Technology On the 18th century two remarkable persons, Mikhail Lomonosov and Erik Laxman followed each other on the chair of chemistry at the Academy of Science in St. Petersburg, Russia. Both were children of the enlightenment, i.e. nothing reached outside their interest. They were, however, two completely different personalities. Lomonosov was a theoretician and always asking ´why´, while Laxman was a practical engineer asking ´how´. Lomonosov was mainly stationed in St. Petersburg, Laxman traveled around whole Siberia. But both were keenly interested in all aspects of the natural world. Pushkin said about Lomonosov "The thirst for science was the strongest passion of his being which was full of passions. An historian, rhetorician, mechanic, chemist, mineralogist, artist and poet, he tried everything and penetrating everything". Laxman´s interest covered botany, cartography, chemistry, ecology, entomology, geography, geology, meterology, mineralogy and zoology and P. S. Pallas called him "acutissimus observator", the most acute observer. Lomonosov begun the study of silicates around 1749-50 when he got a laboratory with high temperature facilities. Preparation of coloured glasses "both for studying the theory of colour and for various uses of these in enameling" occupied him for the rest of his life. Best known are his huge glass mosaic pictures. However, his studies on refractivity resulted also in a different line, development of optical glasses based on lead oxide. As most glasses at that time also Lomonosov´s glasses were based on potassium as alkali. To the very tips of his fingers Lamonosov was a scientist. Laxman had learnt basics of theology in Finland and got in 1762 a job as priest in the Lutheran parish St. Petersburg. From there he was sent to Barnaul a town in SW Siberia close to the Minor Altai mountain ridge to minister the hard drinking miners in the Kolyvan area. His parish was large, some 400 km across and traveling between the places he reported his findings to Linné in Sweden as well as to the Academy in St. Petersburg. In Barnaul he got acquainted to the owner of a local glass works. He became concerned, however, about the vast amount timber needed to produce the potash needed for the process. Thus he began experiments to convert sodium sulphate from Siberian lakes to sodium carbonate. His method was quite ingenious, resembling the Leblanc process invented some 20 years later. He reduced the sulphate to sulphide, mixed it with sand and melted the batch. But the process was poisonous and offensive smelling

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and Laxman abandoned the process when he in Eastern Siberia found a salt lake that could supply sodium carbonate. In 1784 he started a glass works near Irkutsk that supplied house hold glass for whole the district between lake Baikal and Pacific ocean. Although his glasses were in the soda-lime-alumina system, he was the first to use soda ash for large scale production of glass. The year 1784 could therefore be regarded as the year in which modern glass making began. Even though Laxman succeeded Lomonosov at the St. Petersburg char in chemistry, it is doubtful they knew about each other. But together they can be regarded as founders of modern glass science and technology.

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The Classic Texts of Glass Technology
Michael Cable

Abstract:
Although glasses have been made for several thousand years, the oldest intelligible written records about glass making go back only a few hundred years. One of the oldest, not very imformative, is the chapter on glass by Theophilus (twelfth century). Agricola (1541) published the most widely reproduced of all pictures of one type of glass furnace but added very little else. However, the most famous is the Art of Glass written by Neri in 1611 and translated into English by Merrett, who added his own commentary, in 1662. Although that is a rich source of recipes for coloured glasses it contains very little about the practices of glass melting. That book was translated into several languages, the most notable edition being that of Kunckel (1679). At that time chemistry and physics were very primitive and held back by the belief that everything was made from only four basic elements: air, earth, fire and water.

Rapid progress was made at the end of the eighteenth century, notably the downfall of the phlogiston theory according to which melting and solidification involved absorption or evolution of that element which Dalton and Lavoisier showed must have a negative mass.

Discussion of glass making on a more rational basis might be considered to begin with the famous Diderot Encyclopædia, with its beautiful engravings, and the Encyclopédie méthodique (1791) but the works of Bosc D'Antic (1758—80), the liveliest author of that period, should not be ignored.

Several important books appeared during the nineteenth century, the most authoritative being the Guide du Verrier of Georges Bontemps (1868). There were notable publications in Germany which introduced as much science as possible into discussion of glass making. These included works by Leng (1835), Graeger(1868), Benrath (1875) and Tscheuschner (1875). Important accounts from around 1830 were published by Scholz and Kirn. Henrivaux published a two volume work Le verre et le cristal (1883, 1897) but the largest work, also in two volumes, was Dralle and Keppeler's Die Glasfabrikation (1926, 1931). Some highlights from these sources are reviewed.

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About the Presenting Author:
Michael Cable has been a student of Glass Technology since 1952. He was Professor of Glass Technology at the University of Sheffield from 1986 to 1999. His main interests have been in glass melting, a crucial but often neglected aspect of glass technology. His Ph.D. project was a study of refining and other work on melting, homogenizing, refining, and volatilization followed. He was awarded the degree of D.Sc.Tech. for those studies in 1976.

His publications include over 150 papers, the editing of several books, and translations from French and German of four important historic texts.

At different times he has been closely involved with teaching or research in glass technology at the University of Nottingham; the Institute of Chemical Technology, Prague; Åbo Akademi, Finland; the University of Aveiro, Portugal; and the Polytechnic University, Bucharest, Romania. He was a Centennial scholar at Case Western Reserve University in 1980. Åbo Akademi awarded him an Honorary Doctorate in 1993 and he received the President's Award at the 1998 International Glass Congress in San Francisco. In 2006 he was the thirteenth recipient of the German Society of Glass Technology's Otto Schott award, the only other recipient from outside Germany having been Prof. W.E.S. Turner. He is an Honorary Fellow of the Society of Glass Technology and of the Scandinavian Society of Glass Technology.

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The 18th century arcana of William Stephens

Carlos Queiroz, Antonio Pires de Matos, Filipa Lopes

Abstract:
The Coina Royal Glass Factory worked from 1719 to 1747 before being transferred to Marinha Grande on the initiative of John Beare. A detailed historical study on this glass factory was published by Jorge Custódio [1], who was also responsible for the archaeological excavation on its grounds. In 1769 the Portuguese King D. José I and his prime-minister Marquis of Pombal greatly supported William Stephens, allowing him to re-establish a previous ruined glass production centre that bankrupted under John Beare administration in 1767. The production at the new Royal Glass Manufacture in Marinha Grande started ca. 1770 and was administrated by William Stephens. In this work, we report some highlights of the four arcana found in Marinha Grande which consist in truly experimental notebooks where different formulations are carefully essayed and discussed [2] while providing a unique insight into the technology available at the early years of this manufacture. The study of these four arcanes was completed and in this communication we will discuss the recipes used for coloured glass while interpreting the chemical nomenclature used.

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[1] Jorge Custódio, A Real Fábrica de Vidros de Coina (1719-1747) e o Vidro em Portugal nos séculos XII e XVII. Ed. Instituto Português do Património Arquitectónico, Lisboa, Portugal, 2002
[2] António Pires de Matos, Carlos Queiroz, Filipa Lopes, Andreia Ruivo, Augusta Lima, Márcia Vilarigues, Glass colours at Marinha Grande by the last quarter of the 18th century, Annual Meeting of The Society of Glass Technology, Cambridge, September, 2009.

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Experimental Reproduction of Iron Age Scottish Glass Beads: Linking Analytical Techniques to the Production of Replica Artefacts

Martina Bertini

Abstract:
Class 13 spiral decorated Iron Age Scottish glass beads (Guido, 1978) have been object of a thorough study of their chemical characteristics in order to unravel part of the mystery that surrounds their origin and the provenance of the glasses used in their manufacture. The technology involved in their production however remained uncertain, and the complexity of the pattern have eluded the latest attempt of exact reproduction. The literature proposed two methods that could have been used in their manufacture: the production of a grooved body by lost-wax casting in which a decoration was then enamelled, as described by Henderson in a few of his publications (1981, 1987, 1989) and the simple winding method with manual inlay as proposed by Lierke (1995). In this work the production of replica artefacts was attempted with each method described in the literature and with the aid of various techniques. Prior to the experimental, the technological features that characterize the beads have been studied. The morphological description of the artefacts was followed by the study of a few specimens via LA-ICP-MS (Laser Ablation Inductively-Coupled Plasma Mass Spectrometry) and 3D Computer Tomography via Synchrotron Light for the of the study of the internal structure. This information was used both in the technological study and as a comparison between the original specimens and the replicas. The characters observed on the available pool of about 50 class 13 beads show that these specimens were not produced according to a standardized process, but much difference is observable between specimens in terms of technique, skill of the bead maker and results obtained with different raw materials. The results of the experimental manufacture of the artefacts show that the beads were indeed probably produced with both methods, depending on the workshop. Evidences will be shown in support of the hypothesis, and the features linking the replica and the original will be illustrated and discussed in order to shed light on the technological ingenuity that gave birth to such complex creations.

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About the Presenting Author:

Martina Bertini is an enthusiastic PhD student in Analytical Chemistry for Archaeology at the Department of Chemistry at the University of Aberdeen. She graduated in Wood Technology and Engineering and later in Forestry Systems Management at the University of Florence and she started her work looking into archaeological materials in 2005 at the DI.S.T.A.F., Florence, under the supervision of Prof. Marco Fioravanti. After a few months training at the Opificio delle Pietre Dure (Florence) under the guidance of Dr Isetta Tosini, where she developed her interest for a wider range of archaeological materials and analytical techniques, she obtained a 9 months placement at the Department of Chemistry of the University of Aberdeen with Prof. Jörg Feldmann. She then started her PhD with Dr Eva Krupp, discovering her passion for ancient glass when she was given the possibility to write her own proposal for her PhD studies, that she directed to the study of the secrets of Iron Age Scottish glass beads

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They went to larn 'em - British glassmakers help to establish Japan's first Western-style glassworks, 1873-1884

Sally Haden

Abstract:
In the later Victorian period four British glassmakers were invited to Japan to assist in the establishment of that country's first Western-style glassworks. Constructed in 1873 using British designs and guided initially by Manchester flint glass manufacturer Thomas Walton, the glassworks at Shinagawa near Tokyo set the seed for Japan's modern glass industry. Glass in 1860s Japan was a tiny craft industry; windows and domestic glass were almost unknown. Japan had only just begun to open its doors to the rest of the world after centuries of feudal society. Rapid industrialization was underway with Western technological assistance. Shinagawa was conceived for sheet (broad) glass production but there were so many difficulties that sheet glass failed despite all efforts. Indeed Japan had no success with sheet glass until early into the 20th century. In 1879 attention turned to introducing a wider variety of Western techniques. Skilled flint glassmaker James Speed replaced Walton, and specialized materials and equipment, a pot-maker and an engraver came from Britain. Thanks to this introduction, Japanese glassmaking was subsequently transformed. However without enough sheet glass sales to balance the books, Shinagawa had to close in 1884; the British glassmakers returned home. Discussion is invited on the possible reasons for Shinagawa's sheet glass problems. Might it have been it faulty furnace building or design, or poor materials, or the choice of Walton, a manufacturer of *flint* not *window* glass?

About the Presenting Author:
Sally Haden is a private researcher based in Beverley, East Yorkshire, UK. In her family it was always said of her great grandfather James Speed that he went to Japan "to larn 'em". What exactly he had gone to "larn 'em'" being rather unclear, Sally set about some research in 2005.
At Broadfield House Glass Museum in Stourbridge Roger Dodsworth told her that in 2003 he had met Japanese glass historian Akiko Osumi when she been presenting a paper in London about the Shinagawa

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glassworks. She had come in order to seek information about the four British glassmakers so naturally Sally contacted her. This fortunate link has led to extensive collaboration. Sally has studied all four of the British glassmakers together with their families, going back as far as possible in time so as to identify the exact background and experience of these men in the British glass industry. As she knew nothing about glass in 2005 it has been a steep learning curve, not only in glass technology but also in genealogy and industrial history. She was delighted to find that of her four great grandfathers, three had worked in the British Victorian glass industry. Akiko's most recent paper on the subject was published in Japanese in 2009, examining in some detail the initial years of Shinagawa. She is chairperson of the Japanese Glass Manufacturers Association and lecturer in art history at a Tokyo university.

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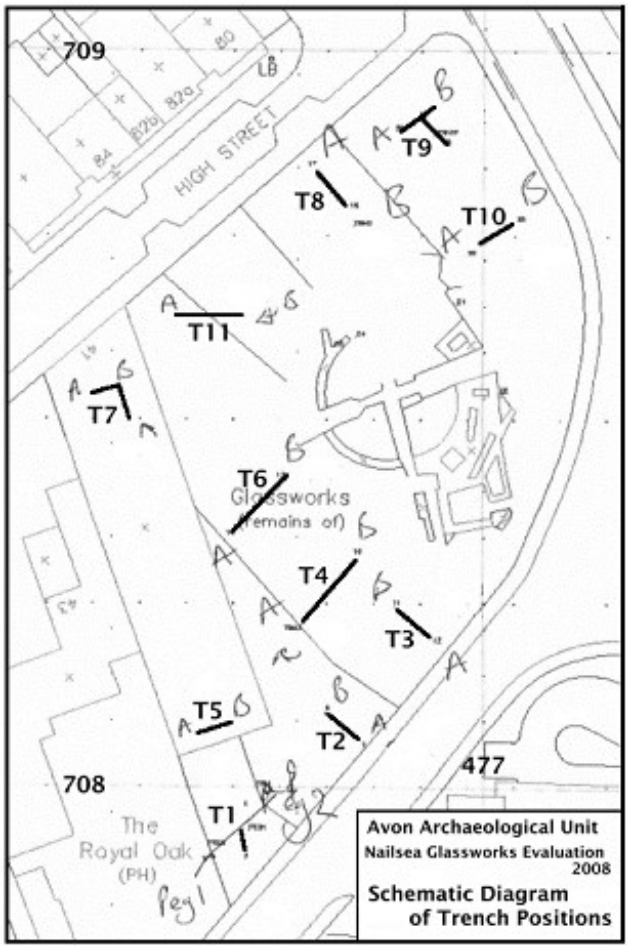
Further Archaeological Work at the Site of the Nailsea Glassworks New House Cone
Andrew Smith

Abstract:
As a result of a further development proposal there was a programme of intrusive archaeological investigations on the site of the former Nailsea Glassworks New House Cone site (Scheduled Ancient Monument [SAM] 28884), High Street, Nailsea during 2008. It was designed to locate and characterise buried archaeological structures, features and deposits preserved in those areas of the monument where archaeological data was lacking in order to inform the proposal. The level of survival of the ancillary buildings and structures was good, and not buried to any significant depth, and this will be shown in the presentation. Significant surviving remains included parts of a 'Belgian Lear' and also of a 'French Kiln', both structures being identified on a plan dated to 1879. A gas-holder was also identified and there is a suspicion that there may have been an experiment in gas-firing the French Kiln. Furthermore it appears that remains of the glassworks' own chemical plant which operated from the 1839s to mid 1860s have survived. As well as material remains some residues were found and sent for analysis.



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Developments of Siemens regenerative and tank furnaces in Saint-Gobain in the XIXth century

Marie-Helene Chopinet

Abstract:
In 2001, in the ICG conference in Edinburgh, M. Cable [1] examined glass making progresses during the industrialization of the 19th century. He observed that engineering and transport rapidly growing had a major influence on the scale of glass manufacture, increasing the ability to obtain fuel and raw materials and distributing products to the customers. Those factors largely contributed to the expansion of the glass industry but could not take place without improvements in technology. Among those new technologies, the Siemens regenerative furnace was a crucial development in glass making because it raised maximum achievable temperatures and greatly improved thermal efficiency. In 1954, F.W. Hodkin made a controversial communication to the Yorkshire Section of the Society of Glass Technology about the Siemens-Tank Story [2] which shows that there was some misinterpretation of information from W.E.S. Turner. Following this, the latter clarified his views to Hodkin who was stimulated to "enquire further into the points he has raised." The Siemens "principle", the use of gas producers coupled with a "regenerative furnace" dates back to the end of the 1850's (British patent No.1320 in 1861). It was applied first to metallurgical and very soon to glass furnaces [2]. The "tank furnace" was patented only in 1872 (British patent No.3478). In his letter reported by Hodkin, Turner said that "there is no doubt that the ideas of the Siemens brothers were worked out to a practical stage in England before being applied elsewhere […] From about 1865 onwards Siemens's gas furnaces, which until then had only acquired a solid footing in England, began to appear on the continent". M. Cable [1] says that "in 1861 William having obtained a British patent was negotiating with Chance Brothers, who at first wanted an exclusive licence, which William would not grant, and dithered, even after accepting that decision." Looking at a well documented internal report written by H. de Coqueréaumont around the end of the first World War about the development of the plate glass technology in the Compagnie de Saint Gobain, it appears that, while William Siemens was discussing with Chance Brothers, or very shortly afterwards, in 1862, he was also in contact with the Glacerie de Montluçon, not yet part of the Compagnie de Saint-Gobain , with the same aim, selling his invention,recently patented (May 1861 No 49068). During the same year in November 1862, contacts between W.Siemens and Saint-Gobain resulted in an agreement and in May 1863,

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the first Siemens regenerative furnace was alighted in the Saint Gobain glass factory. Besides dealing with the Siemens furnaces (regenerator and later, continuous tank furnace) developments in the Compagnie de Saint-Gobain, by analysis of the technical data contained in this unpublished report, the present paper relates a few aspects of the story of the relationship of Saint-Gobain and W. Siemens extracted from the correspondence between the two parties during those critical years, which is kept in the Archives of Saint-Gobain.

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[1] M. Cable, The advance of glass technology in the nineteenth century, Proc. Int. Congr. Glass, Volume 1. Invited Papers, Edinburgh, Scotland, 1–6 July 2001, 121–130

[2] F.W. Hodkin, The Siemens-Tank Story, Journal of the Society of Glass Technology, 1954, 38, 17N

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