THE BEAD FORUM

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Deterioration and Conservation of Unstable Glass Beads on Native American Objects

Robin Ohern and Kelly McHugh

Glass disease is an important issue for museums with Native American collections, and at the National Museum of the American Indian (NMAI) it is one of the most pervasive preservation problems. Of 108,338 non-archaeological object records in NMAI's collection database, 9,687 (9%) contain glass beads. Of these, 200 object records (22%) mention the presence of glass disease on the objects. Determining how quickly the unstable glass is deteriorating will help with long term collection preservation (Figure 1). Additionally, evaluating the effectiveness of different cleaning techniques over several years may help to develop better protocols for treating glass beads. This ongoing research project will focus on continuing research on glass disease on ethnographic beadwork in the collection of the NMAI.

The NMAI has its roots in New York's Heye Foundation's Museum of the American Indian (MAI), established in 1961 by financier George Gustav Heye. Heye's personal collecting began in 1903 and continued over a fifty-four year period, resulting in one of the largest Native American collections in the world. The Smithsonian Institution took over the extensive MAI holdings in 1989, establishing the National Museum of the American Indian. While the collection originally served Heye's mission, "The preservation of everything pertaining to our American tribes", NMAI places its emphasis on partnerships with Native peoples and on their contemporary lives.

Figure 1. Image of blue seed beads with unstable glass on a Potawatomi bag. National Museum of the American Indian, Smithsonian Institution (190580.000). Photo by Robin Ohern.

When the museum joined the Smithsonian Institution, the decision was made to construct a new building on the National Mall and move the collection from New York to a storage facility near Washington, D.C. In preparation for the move, which took place from 1999-2004, the ethnographic portion of the collection underwent a detailed item-specific conservation survey. All cases of glass disease, visible to the naked eye, were noted in the survey.

Introduction to Glass and Its Deterioration

What is Glass?

Glass is made from approximately 70% silica (SiO_2), 20% alkali component (soda, Na_2O; potash, K_2CO_3; or lead oxide PbO), 10% calcium oxide (CaO) as a stabilizer, and other minor components (Koob 2006). Refined or processed sand, or another silicate material, provides the silica component and is called a network former. The alkali flux (soda or potash), a network modifier, lowers the melting temperature of silica, which

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was otherwise out of reach. The final ingredient, calcium oxide, may have initially been added as an impurity in the sand but can also be added intentionally, and acts as a network stabilizer (Francis 2002; Kunicki-Goldfinger 2008). Additional components can include other fluxes, oxidizing agents, fining agents, reducing agents, and colorizing or decolorizing agents.

What is Glass Disease?

Scholars and researchers use many different terms to describe unstable glass, including glass disease, glass illness, glass deterioration, sick glass, weeping glass, sweating glass, and crizzling glass. Visually, unstable glass will develop a fine network of cracks (crizzling), a white crystalline growth on the surface, aqueous or oily surface droplets (weeping), or broken beads. Most of the glass beads with unstable compositions were made in Europe during the seventeenth to mid-eighteenth centuries when glass makers tried to achieve particular visual characteristics such as color or transparency (Lougheed 1988; Kunicki-Goldfinger 2008).

Breakdown of the glass begins with the interaction of water—as liquid or vapor—with the glass surface. Hygroscopic components in the glass as well as surface dust and soiling attract moisture to the bead. If the surface pH is less than 9, then the moisture leaches the alkali and alkaline ions out of the network. This creates a leached layer at the surface of the glass that is depleted in alkali ions and enriched in silica. The ions interact with carbon dioxide or atmospheric pollutants in the air and form salts on the glass surface. Oily and fatty salts were found on the surface of some beads in contact with leather. When the pH becomes greater than 9, the silica structure can break down (Kunicki-Goldfinger 2008:50).

The deterioration of glass beads occurs as a result of the chemical composition of the glass, the use-history of the object on which they are attached, and the environmental history of the object (Kunicki-Goldfinger 2008) (Figure 2). It can also be influenced by the substrate and facilitated by the threading material (Fenn 1987; Carroll and McHugh 2001) (Figure 3). Glass objects with low concentrations of calcium oxide or high concentrations of flux (soda or potash) are susceptible to deterioration. However, any glass object can deteriorate given the wrong environmental conditions (Lovell 2006:16). Unfortunately, the process cannot be stopped once it begins, only slowed down by maintaining certain environmental conditions and removing the surface salts (Koob 2006; Kunicki-Goldfinger 2008).

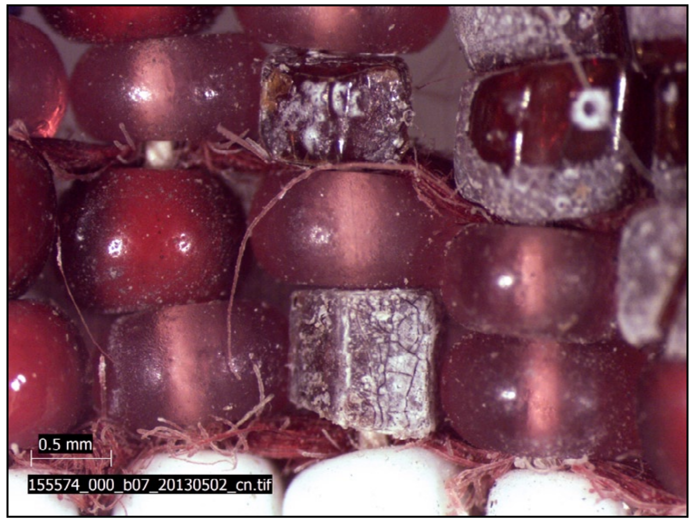

Figure 2: Image of hexagonal red seed beads with glass disease. The other red beads are not deteriorating, which suggests that the glass composition of the hexagonal beads is unstable. Mushuaunnuat (Barren Ground Naskapi) bracelet. National Museum of the American Indian, Smithsonian Institution (155574.000). Photo by Robin Ohern.

Conservation of Glass Beads

Maintaining specific stabile environmental parameters is the best method for the long term preservation of unstable glass. Unfortunately, there is no standard, widely agreed upon set of parameters for unstable glass. Some of the ranges found in the conservation literature include:

- 38% RH + 3% (Ryan 1995; Oakley 1999; Oakley 2001)
- 40% RH + 1-2% (Koob 2006)
- < 35% RH (Sirois 1999)
- 35-40% RH (Lougheed 1988)

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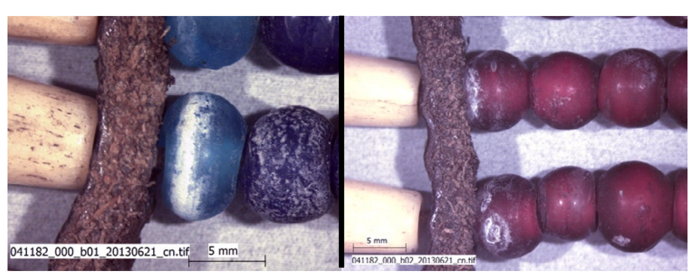

Figure 3. Two images of beads from the same object developing glass disease where in contact with leather on a Plains breastplate. National Museum of the American Indian, Smithsonian Institution (041182.000). Photo by Robin Ohern.

Society News

Stefany Tomalin, our new President, 2014-2016.

Comings and Goings

The votes have been cast and Stefany Tomalin of London, England, is our new president, her three-year term beginning on the first of January. As most of you already know, she has had a long association with beads in various capacities and has conducted research on the history, techniques, and uses of beads and bead jewelry. Stefany is a founding member of the Bead Society of Great Britain, was a trustee of the Bead Study Trust, and has been the co-moderator of the BEADS-L discussion forum since the mid-1990s. We congratulate her and look forward to a productive working relationship.

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As we say welcome to Stefany, we want to thank Bill Billeck for his six years of service in the president's chair. His insight and participation in several projects helped increase the usefulness of the Society and its website. We very much appreciate his efforts on our behalf.

Unfortunately, we must also say farewell to our able Newsletter Editor, Laurie Burgess, who is stepping down with this issue. She was instrumental in making the newsletter the attractive and readable periodical it is today. Many thanks for doing such a good job.

While we have been seeking a replacement for Laurie, we have not found anyone as yet. If you would like to try your hand at editing the newsletter, please contact the editor (karlis4444@gmail.com) for details. It is not an onerous job but it does take a bit of effort.

SBR Website Upgrade

As more and more people turn to the Internet everyday for just about everything, it was deemed prudent to make the SBR website more informative and attractive. We will start with the home page which will soon be revamped and host timely news items and announcements that heretofore had to wait for the issuance of *The Bead Forum*. This will make for a much more rapid dissemination of information concerning conferences, exhibitions, new publications, and bead-related projects, since information will be added as it is received. As in the past, we need your help in collecting this information. Send what you think is relevant to the editor (karlis4444@gmail.com).

As Volume 3 of *Beads* went out of print this year, it is currently being scanned and will be uploaded to our website early in 2014. If this project is well received, other early issues may follow. It is hoped that this will make the journal known to a wider audience and draw new bead researchers to the Society. It is bewildering how many people involved in bead research around the world still do not know about the Society of Bead Researchers and its publications.

— Karlis Karklins

Researching the World's Beads: An Annotated Bibliography
Karlis Karklins

Research on beads is ever increasing around the world and it is difficult to keep up with published material. To alleviate this problem, the Society of Bead Researchers recently added *Researching the World's Beads: An Annotated Bibliography* to its web site: http://www.beadresearch.org/Pages/World_Bead_Bibliography.html.

Compiled by Karlis Karklins, it contains over 2,500 entries that are divided into nine major political-geographical categories: Europe/Mediterranean; Africa; Middle East; Central and South Asia; Southeast Asia; East Asia; Australia and Pacific; North America; and South and Central America, Mexico, Caribbean. There are also two specialized theme groups (Technical Aspects of Beadmaking, and Archaeometric Analysis), as well as a General/Miscellaneous group.

The bibliography stresses archaeological material but reports on modern beadmaking technology and the use of ancient heirloom beads by indigenous peoples have also been included. Beadwork references have generally been excluded as this subject deserves its own bibliography. The exception is where beadwork has been found in an archaeological context.

Publications that deal with North America and appear in the two Karklins and Sprague bibliographies (http://www.beadresearch.org/Pages/Bead_Bibliography.html) are not duplicated in the present bibliography, and the inclusions in general are restricted to items published after 1985. Annotations accompany most of the references, though in some cases the title says it all. In the case of foreign-language titles, an English translation is generally provided or the information is inserted in the annotation to help in searches.

The bibliography is by no means complete and the compiler would appreciate receiving references to publications that do not appear in it, as well as annotations for the items that do not have them (send to: karlis4444@gmail.com). It is inevitable that errors have crept in during the input process and he requests that these, too, be brought to his attention. The bibliography will be updated early in the new year as a substantial number of new reference have already been added since it went on line in August.

Links to our Online Bibliographies on Beads

Researching the World's Beads

http://www.beadresearch.org/Pages/World_Bead_Bibliography.html

North American Bead Bibliographies

http://www.beadresearch.org/Pages/Bead_Bibliography.html

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However these relative humidity parameters may be too dry for the safe storage of adjacent leather or threading materials (Rose 1992).

Clearing surface salts from the glass bead can help to prevent additional deterioration by reducing the pH and removing hygroscopic components. When cleaning beadwork, it is important to consider whether the surface grime is soiling or if it is a traditionally applied material like red ochre or kaolin (a type of white clay). According to conservation philosophy at NMAI and other museums, these traditionally applied materials would not be removed from the object (Doyal 2001). The literature recommends several different options for cleaning glass beads: mechanical cleaning, swabbing with water, with ethanol, or with 1:1 water to ethanol. Conservators begin the cleaning process with mechanical techniques like vacuuming while brushing or using cosmetic sponges (non-latex polyurethane foam), which are least likely to cause damage (Doyal 2001; Frisina 2004).

Depending on the object, conservators can also use water or solvents to clean beads. These techniques are only used after testing the surrounding materials for adverse effects. Water and ethanol have distinct advantages and disadvantages depending on the bead, substrate, and other factors. In both cases, a cotton swab is moistened with the solution and then rolled gently over the beads (Frisina 2004). Several authors (Lougheed 1988; Sirois 1999; Doyal 2001; Lord 2001) recommend cleaning with ethanol – not water – because moisture can cause staining or tide lines on the substrate material, corrosion of nearby metal beads, or create a microenvironment around the moistened thread, facilitating glass deterioration. Others advocate against ethanol and for water because ethanol can displace the moisture in the glass, reveal the full extent of crack development, and solubilize components of the backing material or substrate (Ryan et al. 1996; Oakley 2001; Koob 2006; Smith 2006). While the literature strongly recommends using ethanol over water, a 2006 survey of conservators found that most choose water as their solvent method (Lovell 2006:62).

Unstable Glass in Museum Collections

The published literature was searched for other surveys of deteriorating glass beads (Lord 2001; Carroll and McHugh 2001; Lovell 2006; Fusco and Speakman 2010) and surveys of glass collections to look for unstable glass (Oakley 1990; Cobo del Arco 1999; Oakley 1999). Examples of treatments that discuss how long the beads remained without the reappearance of visible deterioration were also gathered (Sirois 1999; Lord 2001; Smith 2006). References to additional published and unpublished examples would be appreciated.

The four published examples of collection-wide glass surveys include information about the percent of the collection susceptible to deterioration. These percentages range from 13.5 – 20% of collections:

- 20% and 13.5% of glass objects were unstable in two storage areas at the National Museums of Scotland (Cobo del Arco 1999)
- 17% of 344 beaded sculptures and costumes had unstable glass beads at the National Museum of African Art (Fusco and Speakman 2010)
- 16% (400 glass objects out of 6,500) at the Victoria and Albert Museum were unstable (Oakley 1990)
- 38% (49 of 130) costumes required conservation, due to unstable glass and potentially other reasons, in the National Museums and Galleries' Merseyside Decorative Arts Department's collection (Lord 2001:131)

Three collections surveys discuss their results in terms of color and reach different conclusions. The survey of the glass beads in the National Museum of African Art found two different types of deterioration on specific colors of beads (Fusco and Speakman 2010). In contrast, the collection survey done in the United Kingdom in 2001 found "no obvious correlation between color and shape of bead and deterioration" (Lord 2001:131). Finally, in Adam Lovell's discussions with bead researchers, he learned that "certain colors of beads – namely blues, reds, and black – tend to be more susceptible to glass disease" (Lovell 2006:37).

Survey 1: How rapidly does condition change?

Kelly McHugh and Scott Carrlee's previous survey of NMAI's collection in 1999 provided the sample set used to examine the rate of deterioration for glass beads (Carroll and McHugh 2001). During the survey, they identified 187 objects with glass disease and focused analysis on 22 objects. The objects studied in detail included bags, bracelets, breastplates, clothing, necklaces, fishing equipment, gloves, pipe stem fragments and a rattle. Seventeen different cultures are represented by the objects, mostly from the Great Lakes Region, the Plains, and Alberta, Canada. These objects provide an ideal study group because they were rehoused shortly after surveying and have not received treatment since their survey.

Re-surveying the objects to evaluate whether the glass beads have deteriorated further is of particular interest because the objects moved from a variable storage climate in New York to a more stable – though not ideal for unstable glass – climate in Washington, D.C. For the past fourteen years, the objects were stored in the main collections storage area, where the relative humidity (45% + 8 RH) has been slightly higher and wider than what is recommended for deteriorating glass (40% + 1-2 RH) (Koob 2006). Since it is unlikely that glass beads on ethnographic objects will be stored in the ideal environmental conditions for unstable glass due to the presence of other materials, it is important to assess how the beads deteriorate in the current environmental conditions.

There are numerous challenges with conducting research on the deterioration of glass beads. The challenges can be roughly broken up into those related to glass disease and those related to the collection itself. Unstable glass is difficult to study because of the number of factors that can contribute to its deterioration – most of which are unknowable for a museum object. One factor includes the composition of the glass, which will vary from batch to batch even within the same factory and which is difficult to determine on a large scale using noninvasive techniques. Additionally, the current and previous environmental conditions and the use of the object can contribute to the deterioration of glass beads. Once again, most of the information about their pre-accession life remains inaccessible and unknowable for museum objects. Even compiling the complete environmental history of an object after it enters NMAI's collection can be difficult to impossible. The challenges related to using the collection include the huge numbers of objects with records of unstable glass, the wide range of materials and objects that the beads are attached to, and the many different cultures represented in the collections.

Experimental

The authors began with a survey of 22 objects on which McHugh and Carroll had focused additional analysis. Each color or type of bead on an object – called a "bead grouping" for this survey – has an individual survey entry. For example, a given object will have unique survey responses for the red wound beads, red drawn beads, and green drawn beads. The survey of 22 beaded objects resulted in 176 responses per bead grouping.

The authors developed a Google survey form for internal use to survey the objects. The form includes questions designed to record bead color (using Munsell Color standards), manufacturing technique, size, shape, condition, pH, and standardized terminology for glass disease. The questions about manufacturing technique, size, and shape were designed to follow the Kidd and Kidd (1970) system as modified by Karklins (1985), but the information was not recorded in the codes developed by them. The authors decided to record the information in separate questions so that the data could be analyzed more thoroughly.

Figure 4. *Left*, a Northern Athapaskan necklace with unstable glass beads that initially appear stable. *Right*, a detail from an Anishinaabe (Chippewa/Ojibwa) man's leggings that appear to be unstable but do not have an elevated pH and are therefore stable. National Museum of the American Indian, Smithsonian Institution (029182.000 and 188382.000). Photos by Robin Ohern.

Measurement of the pH on the glass bead surface can help to determine whether the bead has alkaline surface salts present (Lougheed 1988; Sirois 1999; Lord 2001:129; Smith 2006; Lovell 2006:37). In some cases, the white surface material can be a culturally applied kaolin that will have a slightly acidic pH (Lovell 2006:37). Several bead groups had a slightly matte surface that can indicate the presence of a thin layer of surface salts but, when tested with pH strips, had a neutral pH. This suggests that the matte surface may be from the tumbling process of manufacturing or may be a sign of previous glass disease damage that has not reoccurred (Figure 4). The steps for pH measurement are (Figure 5):

1. Cut a tiny rectangle of ColorpHast paper (pH 6.5 – 10.0)
2. Moisten paper with deionized water
3. Tap on towel to draw off excess
4. Place and hold on bead for 3 sec
5. Evaluate color change of pH paper

The color change – or lack thereof – of the pH paper indicated if the surface pH was close to neutral and the glass was stable. Alternatively, a pH of 8 usually corresponded with barely visible surface salts, and a pH of 9 or greater usually occurred when the salts were clearly visible on the bead surface.

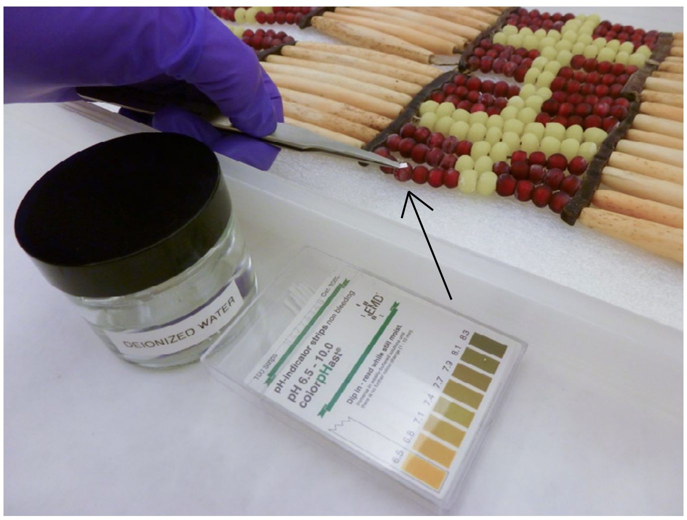

Figure 5. Image of pH testing technique for a Kainai Blackfoot (Kainah/Blood) breastplate. National Museum of the American Indian, Smithsonian Institution (164109.000). Photo by Robin Ohern.

Results and Discussion

Sixteen percent (28 out of 176) of all the bead groupings have more glass deterioration present now than they did during the 1999 survey. This number combines the 23 types of beads that did not have a record of glass deterioration in 1999 but do have surface salts now and the 5 bead groupings that did have a record of glass deterioration in 1999 and have visibly deteriorated further (Figure 6). When only the bead groupings that had previous records of unstable glass are examined, 90% of those groupings have no visual evidence of further deterioration. The evaluation of change is somewhat subjective in the case of glass disease. It depends on the relative humidity at the time of surveying, and involves comparing an image or description of the beads with the object to determine whether the white salts are on more beads now than they were previously.

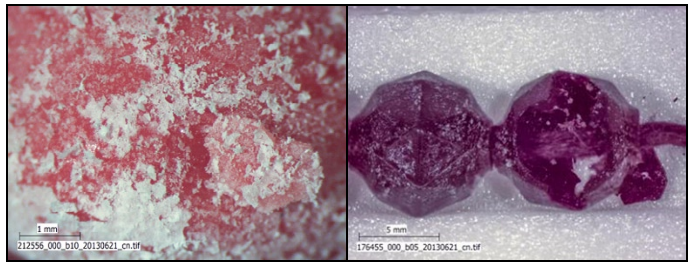

Figure 6. *Left*, detail photomicrograph of surface salts and flaking of glass surface that occurred on a Plains Cree or Prairie Cree necklace since rehousing. *Right*, Hollow blown black faceted beads on a Mi'kmaq (Micmac) necklace that have continued to break apart since rehousing. National Museum of the American Indian, Smithsonian Institution (212556.000 and 176455.000). Photos by Robin Ohern.

The results of the survey were analyzed to assess whether particular colors were more susceptible to deterioration than others. Table 1 shows the percentage of each color of bead that had glass disease present. Three colors had approximately 60% of their beads display glass deterioration: black, red, and blue. Three colors had approximately 50% made from unstable glass – yellow, brown, and purple—however there were much fewer beads of these colors. Green, clear, and orange beads were approximately 40% likely to have glass deterioration. White and pink beads had no examples of unstable glass.

These results correspond with Lovell's findings from discussions with bead researchers that blues, reds, and black tend to be most susceptible to glass disease (Lovell 2006:37). Most scientific research on composition and deterioration focuses on blue beads, with significantly fewer articles about red glass beads (Burgess and Dussubieux 2007; Sempowski et al. 2001) or black beads (Lord 2001). Copper can create different colors in glass, ranging from blue to green. Low lime and high alkali components help to achieve a blue – rather than green – color with copper while also destabilizing the glass and rendering it susceptible to deterioration (Weyl 1959:164; in Hancock et al. 1994). Further analysis on the unstable and stable glass beads is recommended to better understand the factors leading to their deterioration.

Manufacturing technique appears to correlate with the stability of the glass composition (Table 2). While only 3 hollow blown bead groupings were included in the survey, all 3 of them are made of unstable glass. Ninety-five percent of the wound beads are unstable whereas 20 percent of the drawn beads sur-

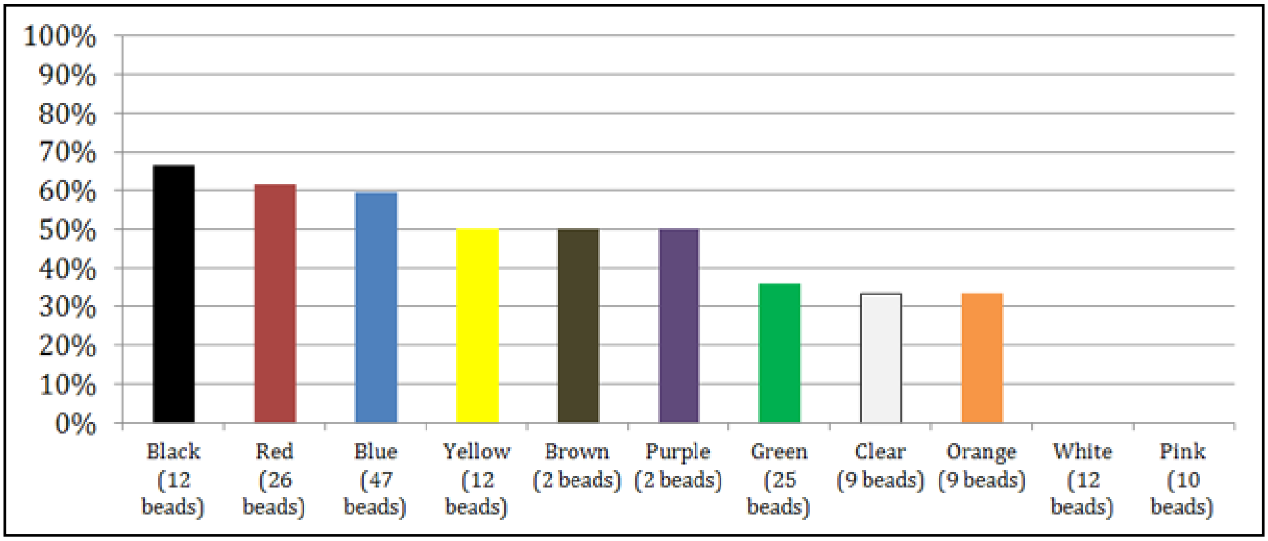

TABLE 1: Percentage of beads that have glass disease by color. The number below each column is the total number of beads of that color included in the survey.

veyed have unstable glass. Based on research done by Karklins, drawn beads tend to be soda-lime-silica glass whereas wound beads are made of potash glasses with slightly lower calcium oxide percentages. The lower calcium oxide concentration could contribute to the tendency for wound glass to be unstable. Additionally, the larger size of potassium ions in comparison with sodium ions could result in larger holes in the silica network (Karklins 1983; Hancock 2013:460–461).

Survey 2: Efficacy of treatment long term

Should glass beads with salts on the surface be cleaned with water, ethanol, 1:1 water to ethanol, or mechanically? Do beads treated with the different techniques re-develop glass disease at different rates? As discussed above, the literature recommends different approaches. Water, typically used to clean vessel glass, is not always suitable for use on glass beads because of their proximity to other materials and the possibility of creating a microenvironment around a moistened thread. Ethanol, another option, can dehydrate the unstable glass and cause further damage. No published research was found in the literature that evaluated the long-term effects of different cleaning options for glass beads.

The authors developed this second survey to assess whether there was a correlation between the treatment material used and the re-development of visible deterioration products on the beads' surfaces. If there is no correlation between treatment material and re-development of salts on the surface, then conservators can continue to choose their treatment material based on the sensitivity of surrounding materials.

This survey is challenging because of the difficulty of selecting a representative sample. Ideally, the objects would all be from the same culture, of the same type (i.e. moccasins), and treated using the different techniques in the same year. Unfortunately, this ideal sample group does not exist. The selected objects are based on those with treatment records, which naturally biases selection towards those areas of the collection that were chosen for exhibitions. Additionally, objects

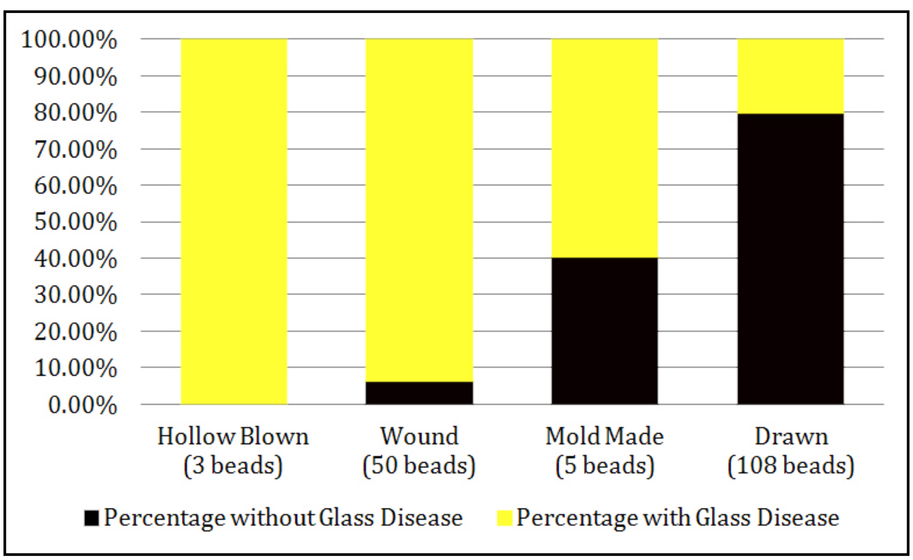

Table 2. Unstable glass beads by manufacturing technique. The number below each column is the total number of beads for each technique included in the survey.

included in exhibitions tend to be in better condition than those that are not selected. This may give a slightly optimistic slant to the results since the objects in worse condition are not included. The evaluation of whether the visual appearance of the beads has changed was done by comparing images and descriptions of the unstable glass from the previous records with the object. In most cases, the images were overall before treatment images of the object making it impossible to assess change since completion of the treatment. Finally, individual conservators may clean beads with slightly different techniques, for example, using different amounts of moisture and cleaning the entire bead or just the exposed areas.

In order to research the long-term effect of treatment, objects that have a history of glass disease on blue and red beads and documented conservation treatments from each technique are being surveyed to assess their current condition. Revisiting objects previously identified as having glass disease will provide insight into the progression of this deterioration and the long-term efficacy of treatment techniques, contributing to the development of long-term treatment strategies. The authors chose to use color to identify a subset of the collection, as opposed to object type (ex: moccasins), culture, or treatment date because of the importance of glass composition. Forty-four objects with red beads were chosen that have records of the presence of glass disease in the conservation database and are currently located in collections storage (Figure 7). Eighty objects with blue beads with conservation records of unstable glass were identified and will be surveyed after completing the red beads.

The 44 objects with red beads come from a number of different cultures and range from moccasins to beaded spoons. Thirty-four cultures are represented by the objects, with the most objects attributed to the Kiowa, Apsáalooke (Crow/Absaroke), Niitsitapii (Blackfoot/Blackfeet), and Northern Tsitsistas/Suhtai (Cheyenne). The objects included bags, baby carriers, clothing, breastplates, bridles, cradleboards, earrings, dolls, necklaces, and pipe bags. For the red and blue beaded objects, some were previously treated while others received no treatment to the beads. The treatments occurred beginning in 1994 through 2011 with most treatments completed in 2006 for exhibitions at the Museum. Of the 36 surveyed red bead groupings, 18 were red-on-white beads (50%). Thirty-five of 36 bead groupings were seed or pony beads made with the drawn technique. While these beads are not necessarily representative of the overall collection (for example, no fancy beads were included), the relative unity of the red beads (mostly drawn seed beads of similar color) enables comparison of treatment techniques.

The broad category of red beads includes monochrome red beads as well as red-on-white (also known as “white hearts”) and red-on-green beads, or cornaline d’Aleppo. Red-on-green beads, which have a translucent green glass inner layer covered with an opaque red outer layer, were available prior to the 1830s. After the 1830s, red-on-white beads (Figure 8), which have a white core surrounded by a transparent red exterior layer, replace the red-on-green beads (Sprague 1985; Ross 2000; Billeck 2008). Most of the beads are pony or seed beads and none of them are fancy beads. There are 3 techniques for coloring glass red: copper to make

Figure 7. ***Left*****, a detail of glass disease on translucent red seed beads.** ***Right*****, an overall image of the Lakota (Teton/Western Sioux) cradleboard cover part/fragment. National Museum of the American Indian, Smithsonian Institution (011107.000). Photos by Robin Ohern.**

Figure 8. Detail of unstable red-on-white seed beads on a pair of Assiniboine (Stoney) gauntlet gloves. National Museum of the American Indian, Smithsonian Institution (201368.000). Photo by Robin Ohern.

opaque redwood beads (Sempowski et al. 2001:503), ruby red glass colored by a colloidal suspension of gold available after 1859 (Francis 2008:64), and selenium after 1890 (Francis 2008:73). Red glass also frequently includes lead oxide as one of the components in the glass (Weyl 1959:385; Burgess and Dussubieux 2007:62, 70).

Experimental

This second survey recorded information about the bead (shape, manufacturing technique, opacity, Munsell color number), materials in contact with the beads, the pH of the red beads, and a comparison with the previous treatment. The results were then entered into a Microsoft Excel spreadsheet. The pH of the beads was measured using the same technique as described in the previous survey.

Results and Discussion

Several of the objects cleaned with water and ethanol had more than one color or type of red glass bead on them. At the time of this publication, three objects – representing six red bead groupings – cleaned with water have been surveyed. Ten objects – representing 11 bead groupings – cleaned with ethanol have been surveyed. Based on the bead groupings surveyed so far, 4 out of 6 groupings (66%) cleaned with water in 2006 have redeveloped glass disease. Eight out of 11 groupings (73%) cleaned with ethanol have redeveloped surface salts since their treatments. The beads treated with ethanol that redeveloped salts were cleaned in 1994 (1 grouping), 1999 (1 grouping), 2000 (1 grouping), 2002 (3 groupings), 2004 (1 grouping) and 2005 (1 grouping). The 3 groupings that did not redevelop salts were cleaned in 2002, 2004, and 2008. This suggests that surface salts can redevelop within several years time and that cleaning does not prevent the redevelopment of visual signs of deterioration.

Interestingly, beads cleaned with a 1:1 mixture of ethanol and water were less likely to redevelop surface salts and none of the beads cleaned mechanically redeveloped surface salts (Table 3). For those cleaned with the ethanol and water mixture, 2 of the 4 groupings surveyed (50%) have surface salts visible now. While this is significantly fewer than those cleaned with water or ethanol, the sample size is also smaller. Further research, for example the upcoming survey of blue beads, may provide additional information.

Eleven of the 15 bead groupings on untreated objects have been surveyed at the time of this article. Four of the objects do not have glass disease on their red beads: the beads had a neutral pH and the surface appearance was likely due to surface grime and dust. Six of the remaining 7 beads which were not treated for glass disease do not appear to have deteriorated further since initial examination.

Regarding the survey process, this second survey confirmed several things discovered during the first condition change survey. Measuring pH of bead surfaces is very helpful at identifying which have alkaline surface salts and which are either dusty or covered with kaolin. Additionally, evaluating condition change based on overall object images is very difficult. The type of documentation that best enables condition change evaluations has an overall image with at least one after-treatment detail area included.

Conclusions

Glass deterioration affects numerous beaded objects in the collection of the NMAI. These objects have conservation requirements different from unstable glass vessels or non-composite objects. The surveys found that wound beads tend to be more unstable than drawn seed or pony beads and that red, black, and blue beads are the most unstable colors. Treatment options for cleaning glass beads are still being researched but preliminary results suggest that the 1:1 ethanol:water mixture might be more successful long term than either water or ethanol on its own. Further surveying will be done of blue beads that have records of glass deterioration and cleaning.

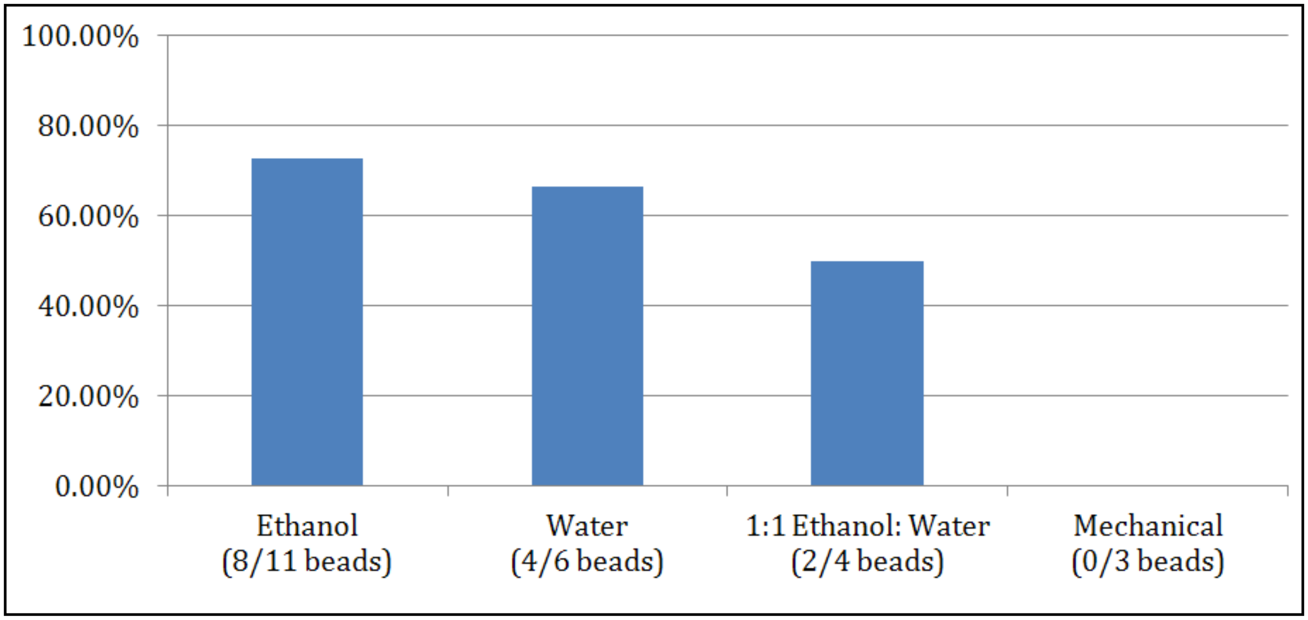

TABLE 3: Percentage of bead groupings cleaned with different techniques that redeveloped surface salts. The numbers underneath each column represent the number of beads out of the total cleaned with each technique that redeveloped glass disease.

In addition to information about unstable glass beads, the surveys have confirmed the importance of several conservation practices. Firstly, recording treatment materials in reports makes it possible to go back later and understand what treatment was conducted on the object. Secondly, it is important to record post treatment condition with words and images – especially if the object is tagged as needing long term monitoring.

The authors hope to do further research on several particular questions and would appreciate any information or samples about them. A particular type of red spherical wound bead (Figure 3, right) was repeatedly found to be unstable on many different types of objects. Why does this particular type of bead deteriorate and do other people see this phenomenon in their collections? Why do black beads (Figure 6) also have a high rate of unstable glass? By assessing the distribution of unstable glass beads throughout the collection and developing an understanding of why these beads deteriorate, the authors aimed to identify at-risk groups of objects or beads and assist in long term collection preservation.

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Conferences, Symposia

52nd Annual Seminar on Glass:
Beads - Life, Trade, Ritual
Corning Museum of Glass
October 17-19, 2013

In connection with its exhibition *Life on a String: 35 Centuries of the Glass Bead*, the Corning Museum focused its annual Glass Seminar on the theme of beads and beadwork. Speakers included Robert Liu (*Explaining Historic Beads through Contemporary Glass Techniques*), Mary Mullaney (*Chevron Bead Stories*), Christopher DeCorse (*Bits of Glass, Pieces of the Past: Beads and Beadworking in West Africa*), Alice Scherer (*From Basket Making to Beadworking: An Examination of the Evolution of an Indigenous Art Form in the 19th-century Pacific Northwest*), Karlis Karklins (*Souvenir Beadwork of the Six-Nations Iroquois*), Michele Majer (*Bedazzled: Bead Embroidery in 20th-Century French Haute Couture*), Tina Oldknow (*Life on a String and Art in the Round: Contemporary Beaded Sculpture*), and Kristina Logan (*Diverse Artistry of Contemporary Beadmaking*).

Glass beadmaking demos were conducted by Kristina Logan, Ralph Mossman and Mary Mullaney of Heron Glass, and beadwork scholar and flamework artist Caitlin Hyde.

Demonstration at the Corning Studio: *Creation of Chevron Beads, from Bubble to Bead* by Ralph Mossman and Mary Mullaney, of Heron Glass in Driggs, Idaho.

Bead Archaeometry Symposium
Society for Historical Archaeology Conference
Quebec Convention Centre
January 10, 2014

There will be a short session on the archaeometry of glass beads. This takes place in Quebec City, Quebec, Canada from 10:30 to 11:30 a.m. in Room 303B, 1000 Boulevard René-Lévesque Est.

SYM-43. *New Research in Material Culture Studies: Archaeological Science Applied to Objects and Contexts* – Chair: Adelphine Bonneau.

10:30 AM Adelphine Bonneau, Jean-François Moreau, Ron Hancock, Réginald Auger, Bertrand Emard – Archaeometrical Study of Glass Trade Beads from the ClFi-10 Site: Results and their Potential to Investigate Amerindian Exchange Networks.

10:45 AM Heather Walder – Small Beads, Big Picture: Patterns of Interaction Identified from Blue Glass Artifacts from the Upper Great Lakes Region.

11:00 AM Charlotte Goudge – Historical Glass and Tracer X-Ray Fluorescence: Compositional Analysis of Black Glass in Antigua, West Indies.

11:15 AM Ron Hancock, Jean-François Moreau – Some Thoughts on Unraveling the Chemical Complexity of Turquoise/Green Glass Trade Beads.

Abstracts of the presentations may be found on pp. 226-227 of the Conference Program: http://sha2014.com/program.pdf

A separate paper of potential interest to researchers interested in African beads will be presented during:

SYM-35A *Good Questions Met by Archaeological Revelations*, Friday, January 10, QCC: 301A — Chair: Christopher Fennell.

9:30 AM Flordeliz Bugarin – Insights in the Unexpected: A Discovery of Cattle Horns and Beads.

This paper attempts to interpret a significant cache of early-19th-century cattle horn cores found covered and intertwined with over a thousand glass seed beads at Fort Willshire, South Africa.

Exhibitions

Floral Journey: Native North American Beadwork
Autry National Center of the American West

Vest, Eastern Sioux, 1870s. Deerskin, moose skin, trade cloth, porcupine quills, commercial dye. The General Charles McC. Reeve Collection. Southwest Museum of the American Indian Collection, Autry National Center; 491. P.3146

March 15, 2014–April 26, 2015

Art and spirituality converge with trade and commerce in *Floral Journey: Native North American Beadwork*, a groundbreaking exhibition opening in March 2014. Through 250 unique objects and personal stories, the exhibition is the first of its kind to explore how beaded floral designs became a remarkable art form as well as a means of economic and cultural survival for the Native North American people.

Floral Journey presents moccasins, bags, dresses, hats, jackets, and other exquisite beaded and quilled items selected from fifteen cultural institutions, including the Autry's Southwest Museum of the American Indian Collection, and multiple private collections. Many of the objects will be displayed to the public for the first time.

The Autry in Griffith Park
4700 Western Heritage Way
Los Angeles, California

Catalog:
Floral Journey: Native North American Beadwork
by Lois Sherr Dubin
Published by Autry National Center / University of Washington Press

The companion publication to the exhibition celebrates the beauty and power of Native North American floral art. This beautifully illustrated book showcases exquisite materials relating to the story of how American Indian flower imagery, following European contact, became a major art form as well as a symbol of cultural and economic resilience. The story begins with the earliest teachings of silk floral-embroidery techniques and designs to young Native women in seventeenth-century Quebec missions and continues through today with dazzling contemporary beadwork from all regions. The book will be available for purchase in the Autry Store in both hardcover ($65) and paperback ($40) editions.

Pouch, possibly Wasco, 1860s–1870s. Buckskin, glass beads. Southwest Museum of the American Indian Collection, Autry National Center; 3.C.147

Who We Are

The Society of Bead Researchers is a non-profit corporation, founded in 1981 to foster research on beads of all materials and periods, and to expedite the dissemination of the resultant knowledge. Membership is open to all persons involved in the study of beads, as well as those interested in keeping abreast of current trends in bead research. The society publishes a semi-annual newsletter, *The Bead Forum*, and an annual journal, *BEADS: Journal of the Society of Bead Researchers*. The society's website address is http://www.beadresearch.org.

Contents of the newsletter include current research news, requests for information, responses to queries, listings of recent publications, conference and symposia announcements, and brief articles on various aspects of bead research. Both historic and prehistoric subject materials are welcome.

The deadline for submissions to the next *Bead Forum* is March 1, 2014. Electronic submissions should be in Word for Windows 6.0 or later with no embedded sub-programs such as "End Notes." References cited should be in Historical Archaeology format (http://www.sha.org/publications/for_authors.cfm).

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