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Thinking Inside the Box: The Technical Study and Treatment of Keith Tyson's *Automata No. 1*

About the Artwork

Automata No. 1 is a sculpture created by artist Keith Tyson in 2005 for a solo exhibition at Pace gallery in New York. Claimed as a total loss by an insurance company after reports that it was damaged during Hurricane Sandy in 2012, the sculpture was donated to the Winterthur/University of Delaware Program in Art Conservation (WUDPAC) study collection in 2015. When it arrived at Winterthur, it was in 23 pieces (Fig. 1). In addition to loss of structural integrity and correct assembly, its main condition concerns included surface dirt and grime, misalignments, abrasions, and chips and losses to the surface (Fig. 3-5).

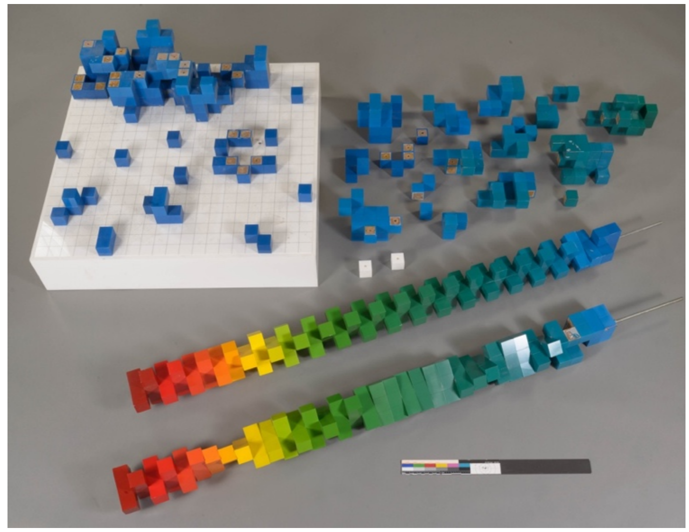

Figure 1. *Automata No. 1* Before Treatment

Figure 2. *Automata No. 1* shown at Pace Gallery
Image courtesy Pace Gallery New York

As can be seen in images of the work prior to its damage, the sculpture consists of a white, rectangular base with rigid, multicolored cubes stacked in a derived arrangement that terminate in two rainbow towers (Fig. 2). There are forty horizontal levels arranged in a transitional color gradient; each row has a unique color, resulting in forty colors overall. The cubes are secured to the base with ferrous metal fittings, including threaded interior armatures, and the cube formations are secured to each other with ferrous pins and epoxy.

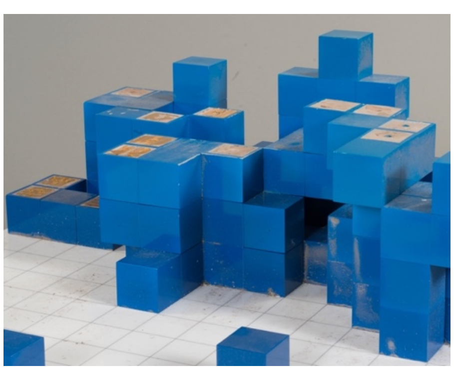

Figure 3. BT condition: dirt and grime

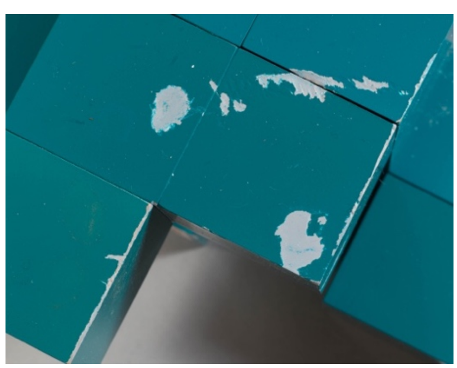

Figure 4. BT condition: abrasions

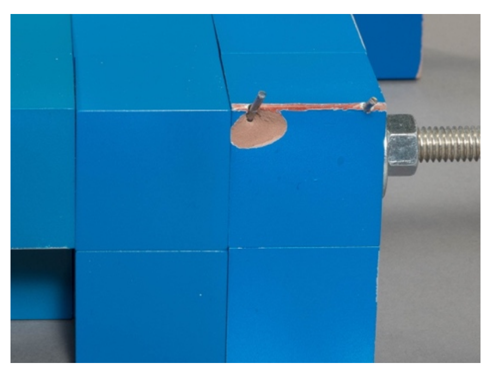

Figure 5. BT condition: chips and losses

Keith Tyson (b. 1969) is a British artist who lives and works in Sussex and London. He initially studied as an apprentice engineer making nuclear submarines before entering the Carlisle College of Art and later the University of Brighton, where he earned an M.A. in Alternative Practice. Since then he has sustained an active career as an artist and has exhibited in museums and galleries worldwide, including the Tate Modern, the Centre Georges Pompidou, and the Venice Biennale. He has received multiple awards for his work, including the prestigious Turner Prize in 2002.

Covering a multiplicity of styles, Tyson works in a variety of media such as painting, drawing, sculpture, installation, and performance. Sometimes referred to as a conceptual artist, his fascination with logic, scientific concepts, and philosophical theories is reflected throughout his creative process, from technical drawings to realized sculptures. His work hinges on the primacy of the idea; he pursues questions of chance, causality, unpredictability, limitations, and the interconnectedness of everything (Artsy 2016).

Automata No.1 was exhibited by Pace gallery in New York from October 15 through November 12, 2005, in Tyson's solo exhibition *Geno Pheno 2*, which comprised 27 paintings and 18 sculptures. *Geno Pheno*, short for the genetics terms genotype-phenotype, was constructed around a logical proposition and designed to illuminate certain aspects of causality (Glimcher 2008). Each work has a *Geno* component, representing a generative system, and a *Pheno* component that is the potential outcome of that genotype. The works in this series capture the transformative interactions between the *Geno* and *Pheno* phases. In the case of *Automata No. 1*, the gridded base symbolically forms a system with the potential to generate numerous results. The aggregate form of smaller cubes arising from the grids is one of those manifestations, hence the phenotype.

Project Goal in the Absence of the Artist's Voice

Automata No.1 was assigned to us as a student project. It was selected to give us an opportunity to explore issues in conserving contemporary art, from both a material and ethical stance.

Hoping to learn more about Tyson's creative process, as well as his opinions on the preservation of his works, we attempted to contact the artist through multiple avenues but we were unable to reach him. We eventually heard from a contact at the Tate that he might currently be "off the grid," and we began to think about how to develop a responsible and practical treatment protocol of a contemporary artwork without having the artist's input.

We were able to gain some information about the object from other sources, including the artist's website and Pace Gallery, which listed the media as foam, lacquer, and acrylic. Additional information surfaced after we came across images of *Automata No. 1* on a fabricator's website named Prototype New York. According to the fabricator, the work was damaged during transit (Lawson 2017). This helps explain the amount of cube detachment and physical losses and abrasions observed on the work. It is uncertain how the object was stored after transit, however, and it could have been further damaged during Hurricane Sandy. This seems likely, as tidelines, which formed where dirt accumulated, are apparent on the base.

As there are no known technical analyses of Tyson's work, conducting a technical study of the object was key to understanding its material composition and inherent vulnerabilities, augmenting the information provided by the gallery and fabricator, and helping inform treatment decisions.

Technical Study

Using a range of analytical techniques in a comparable way, we assessed many of the proprietary materials used in the fabrication of *Automata No. 1*. The study also was useful in showing which analytical techniques can be successfully used to analyze the modern, proprietary materials used in contemporary art fabrication. Techniques used in the study included cross-section microscopy,[1] x-ray fluorescence spectroscopy (XRF),[2] Fourier-transform infrared spectroscopy (FTIR),[3] Raman spectroscopy,[4] scanning-electron microscopy/energy dispersive spectroscopy (SEM-EDS)[5] and

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[1] Three samples were taken for cross-section examination and subsequent use for SEM-EDS. Samples were taken under 20X magnification using a #15 scalpel blade, then cast in Extec Polyester Resin and sanded. The cross-sections were photographed at 20x magnification using Auto Vision SE64 using normal reflected light, dark field, and 365nm ultraviolet radiation.

[2] X-ray fluorescence was used to characterize the metal armature, possible filling material in the substrate and priming layers of the cubes, and the elemental composition of the colorants used in the lacquer coating. XRF was performed using the Bruker ArtTAX µXRF spectrometer, equipped with a rhodium tube and operating at 600µA current, 50kV voltage, and 100 seconds live time irradiation. The spot size is approximately 70-100 microns, with element detection range from potassium (K) to uranium (U). All spectra were collected using Intax version 4.5.18.1 software; images of the tested areas were captured using the CCD camera.

[3] FTIR was performed to better understand the substrate of the cube components of the sculpture, the components of the grey priming layer, white priming layer, and the colored coating, and the adhesive used in the joining of the cubes. Samples were taken using a #15 scalpel and prepared under magnification using a stainless steel rolling grinder directly on the diamond cell. Analysis was done using a Thermo Nicolet Continuµm FT-IR microscope. Data collection was performed using the OMNIC software; 128 scans were taken at a resolution of $4cm^{-1}$. All four spectra were compared to reference spectra using searchable databases.

[4] Raman was performed to better understand the potential pigment used in the blue coating. Analysis was performed using a Renishaw inVia Raman Microscope with a 785nm diode laser, with WIRE 3.4 and OMNIC software. The analysis was run in the range of 100 – 1200 cm^{-1}, 1% laser power and ten accumulations for 20 seconds. Further analysis using Raman spectroscopy was later done on samples taken from one of the multi-colored towers. This set of analysis was performed in the range of 100-2200 cm^{-1}, 1% laser power and one accumulation for 10 seconds.

[5] One of the cross-sections was further analyzed using SEM-EDS to confirm the distribution of materials found in previous analysis. After thinning with a jewelers saw, the sample was mounted to a 12.7x3.1mm aluminum SPI Supplies Zeiss slot head stub using SPI Supplies 12mm double-sided carbon tabs. The area surrounding the sample was coated using SPI Supplies conductive carbon paint, and the analysis was run using a Zeiss EVO MA15 scanning electron microscope with a Bruker XFlash 6130 detector and a LaB_6

pyrolysis-gas chromatography/mass spectrometry (Py-GC/MS).[6]

Interior Armature

Using XRF, the interior metal armature within the rainbow towers was found to be a ferrous iron alloy. The presence of zinc in the XRF spectrum is likely from a zinc-plating.

Base

We presumed that the white base was an acrylic, based on a description on the artist's website. A small sample taken from the underside was characterized with Py-GCMS by Winterthur scientist and Affiliated Associate Professor, Dr. Chris Petersen, as acrylic poly(methyl) methacrylate with a phthalate plasticizer. Acrylic sheet, or poly(methyl methacrylate), is highly susceptible to crazing from solvent exposure, however it is also sensitive to relative humidity in conjunction with temperature fluctuation, which can cause similar distortion to the material. Since *Automata No. 1* may have experienced water exposure and temperature fluctuation while in storage, this condition issue may develop over time.

Cubes

The adhesive used to join the cubes was characterized with FTIR as an epoxy resin. This was later confirmed by the fabricator as a 5-minute epoxy. A cross-section sample revealed the very distinct layers achieved during the fabrication of the cubes (Table 1). There is the interior foam substrate, three priming layers and the final, colored lacquer coating. Using XRF (Fig. 6), the substrate of *Automata No. 1* was characterized as likely containing mineral silicates and calcium carbonate. An XRF spectra taken at an exposed area indicated peaks for calcium and potassium. Mineral silicates and chalks were likely used as fillers and extenders.

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source at 20 kV accelerating voltage for the electron beam, a 0° sample tilt and approximately 10mm working distance. Collection of EDS spectra was undertaken using a Bruker Nano X-flash® detector 6 | 30 and analyzed using Smart SEM and Quantax 200/Esprit 1.9 software.

[6] Samples were analyzed by Py-GC/MS with no chemical derivatization. Samples were placed into a 50µL stainless steel Eco-cup fitted with an Eco-stick and placed into the pyrolysis interface where it was purged with helium. The Frontier Lab EGA/PY-3030D double-shot pyrolyzed system was interfaced to a Hewlett-Packard 6890 gas chromatogram equipped with 5973 mass selective detector (MSD). A J&W DB-5MS Agilent 19091S-433 capillary column was used for separation (30m × 250µm × 0.25µm) with helium carrier gas set to 1.2 mL/minute. Samples were pyrolyzed using a single-shot method at 600°C for 12 seconds. The split injector was set to 280°C with a split ratio of 30:1 and no solvent delay (9.26 psi). The GC oven temperature program was 43°C for two minutes then ramped at 10°C/minute to 325°C, followed by a five-minute isothermal period, for a total run time of 34.7 minutes. The MS transfer line was at 320°C, the source at 230°C and the MS quad at 150°C. The mass spectrometer was scanned from 33-600amu at a rate of 2.59 scans per second.

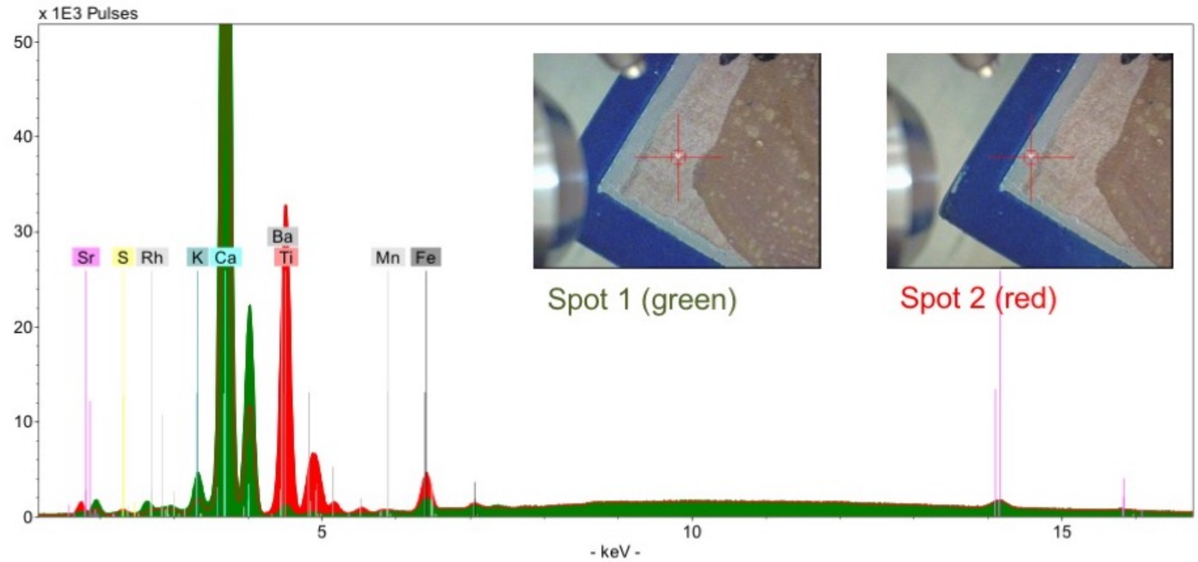
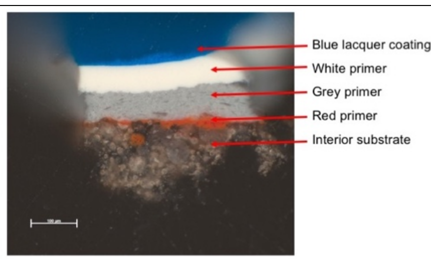
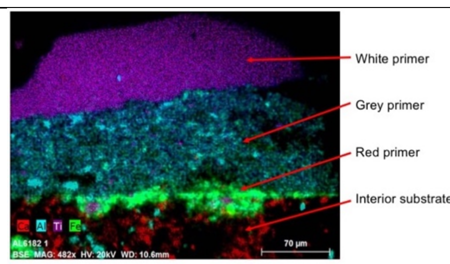
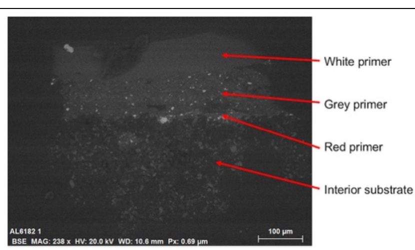
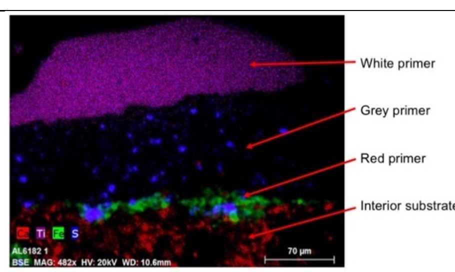
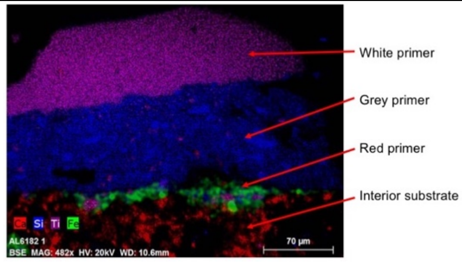
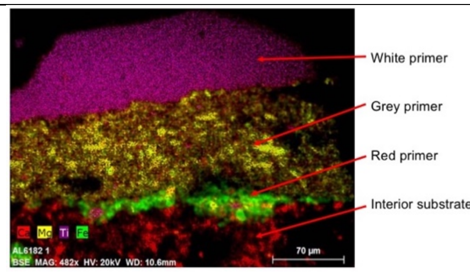


Figure 6. Substrate (spot 1) and grey priming layer (spot 2) overlaid, Winterthur Museum GACP1628 (AL6182).

The presence of mineral silicates was further characterized using EDS false color mapping wherein elements like silicon and aluminum, which are below the detection limit of XRF, were distinguishable (Table 1).

Table 1. SEM-EDS false color mapping of GACP1628 (AL6182)

Cross-section	EDS false color map	Notable elements
 Visible light		· Titanium in white priming layer · **Aluminum** in grey priming layer · Iron in red priming layer · Calcium in interior substrate
 Back-scattered electron map		· **Sulfur** in grey priming layer

		• **Silicon** in grey priming layer • Small amount of silicon in interior substrate
		• **Magnesium** in grey priming layer

FTIR indicated the presence of chalk as well (Fig. 7); this was due to the strong and broad absorption caused by the stretching of bonds between the oxygen and carbon.

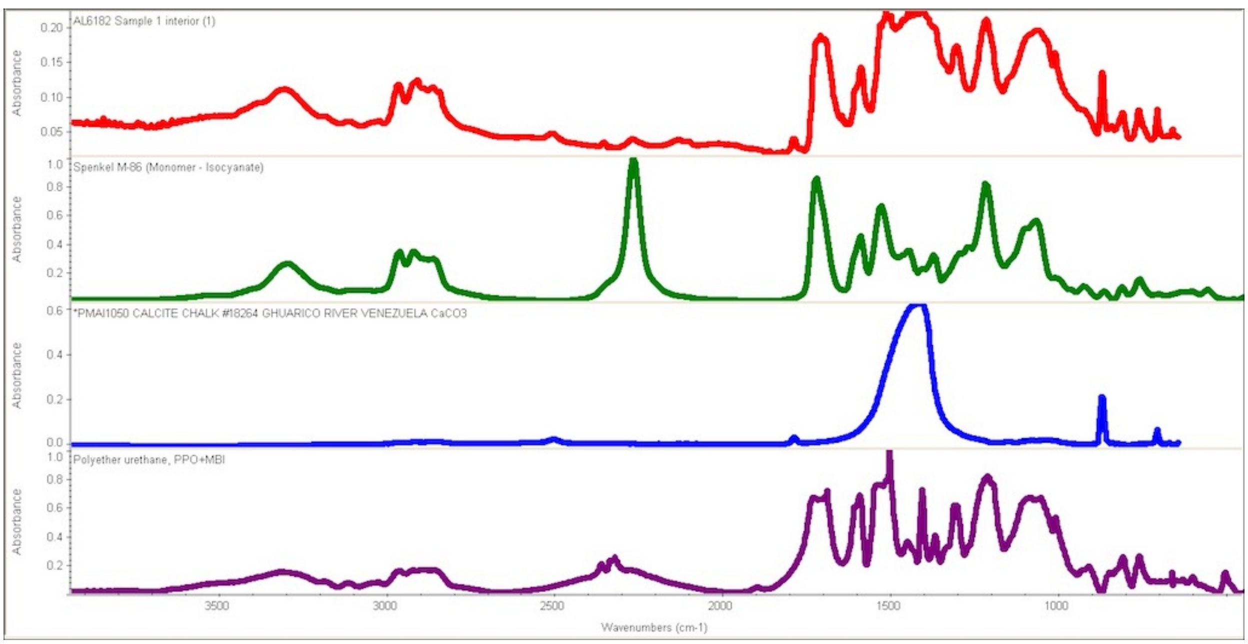


Figure 7. Sample F1, cube substrate, Winterthur Museum GACP1628 (AL6182), shown with reference spectra for polyether urethane, isocyanate and chalk.

FTIR also characterized the substrate as a polyether urethane (Fig. 7). There are two types of polyurethanes: polyurethane ether and polyurethane ester. The ether form degrades via photo oxidation, while the ester form degrades via hydrolysis (van Ooosten 2011). Analysis of polyether urethanes can be carried out using FTIR due to visible absorbance at the ether and ester linkage, however the absorption for urethane can sometimes mask the distinguishing peaks. Since the type of polyurethane used is so pertinent to the degradation process of the material, the substrate was further characterized and was confirmed as the ether form with Py-GC/MS, based on the presence of methylene dianiline isocyanate (Fig. 8).

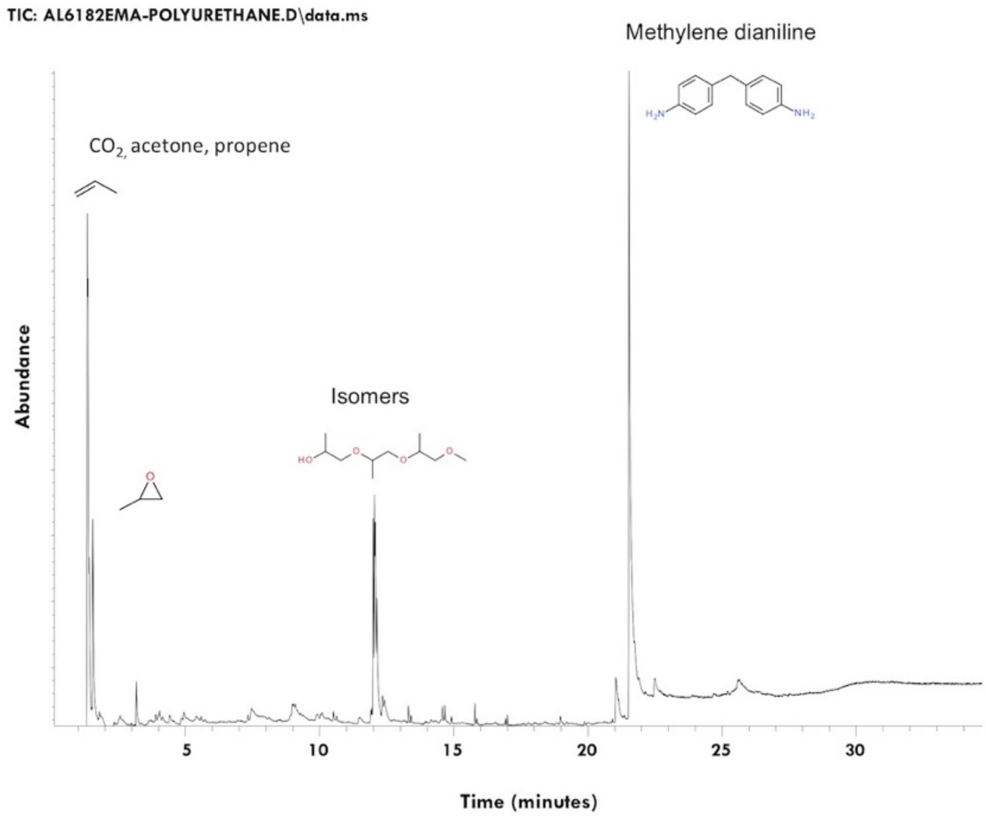


Figure 8. Py-GC/MS of the substrate, Winterthur Museum GACP1628 (AL6182). Chromatograms courtesy of Dr. Chris Petersen and Catherine Matsen.

Polyurethane ether is known for its use in commercial applications and subsequently for its degradation issues (van Ooosten 2011). Since photo-induced degradation is the main culprit, it is possible that sealed foams will remain stable for longer. In the case of *Automata No. 1*, the priming layers and lacquer coating have likely limited this type of exposure.

According to Pace and Prototype New York the substrate is the proprietary material RenShape, a polyurethane modeling board available in a variety of colors and densities. SDS information varies, depending on the source: one lists RenShape as a cured polyurethane, another lists it simply as a "board material" with the addition of "limestone."

There are up to three visible priming layers applied to the substrate. When viewed in false color mapping, the red primer appears to be iron rich (Table 1). The grey primer appears to contain mineral silicates as well as sulfur, possibly indicating a barium sulfate pigment. Barium is difficult to detect using SEM/EDS or XRF due to interference or overlap with titanium, which is readily present in the white layer. Of the materials listed by Pace, there is no mention of priming layers. However, the fabricator from Prototype NY referred to a grey acrylic primer used in the automotive industry and a white nitrocellulose primer used for sign painting. FTIR was used to characterize both the grey and white primer, confirming the information provided by the fabricator (Fig. 9-10).

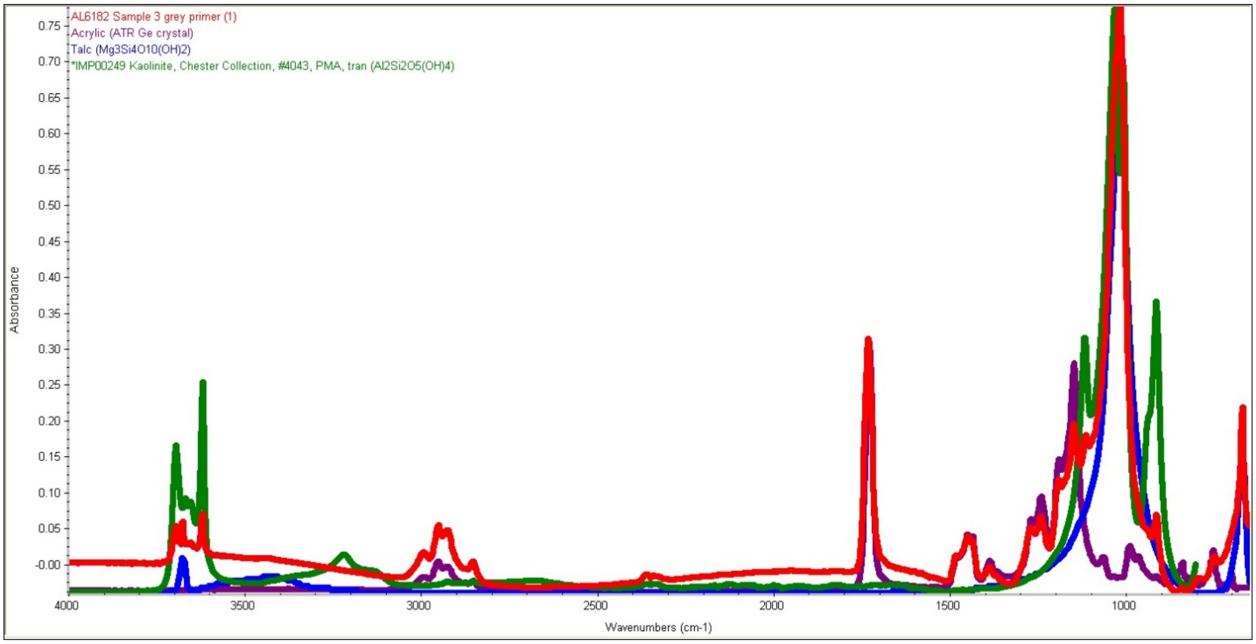


Figure 9. FTIR of grey acrylic primer, Winterthur Museum GACP1628 (AL6182), shown with reference spectra for acrylic, talc and kaolinite.

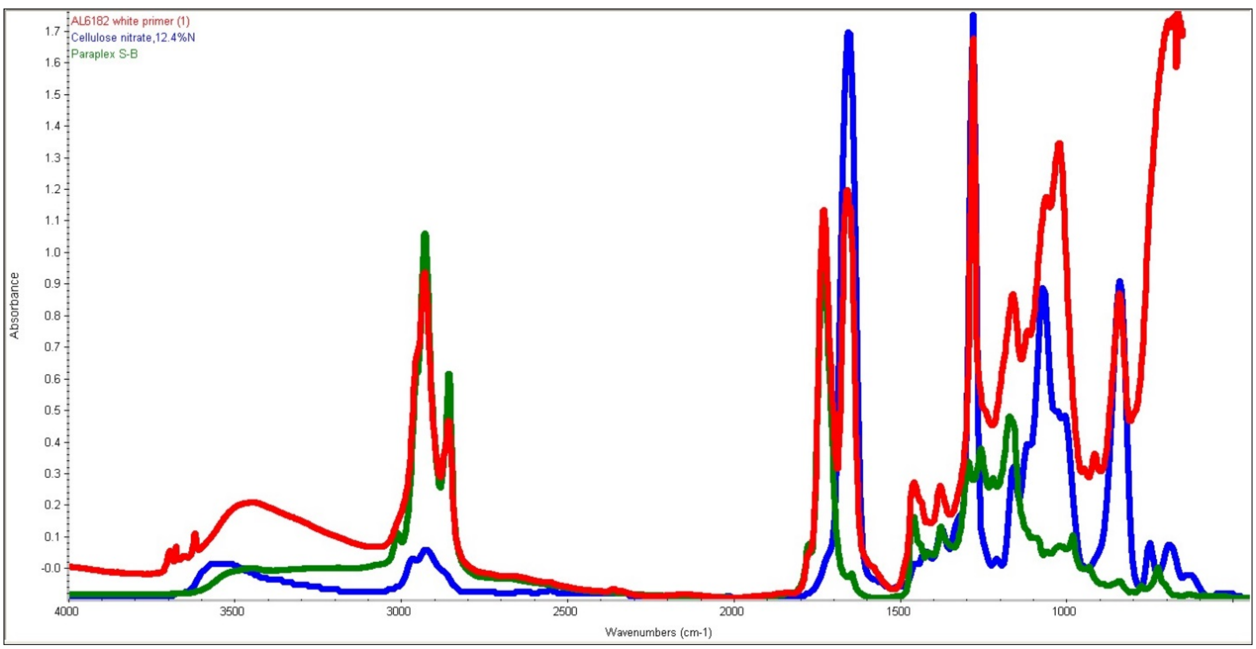


Figure 10. FTIR of white cellulose nitrate priming layer, Winterthur Museum GACP1628 (AL6182), shown with reference spectra for cellulose nitrate and Paraplex S-B.

The FTIR spectrum for the grey primer is also stacked with the spectra for talc, a magnesium silicate and kaolinite, an aluminosilicate. These findings are consistent with the mineral silicates suspected after XRF and EDS false color mapping.

Midway through analysis, Pace Gallery provided additional information indicating that a "high-pigment nitrocellulose printing lacquer" was used to coat this piece. FTIR successfully characterized the binder for the colored lacquer coating as cellulose nitrate with the addition of a plasticizer (Fig. 11). Cellulose nitrate can be partly characterized based on nitrate group absorption. The notable carbonyl peak can change in height depending on the type and amount of plasticizer present (Petersen 2017).

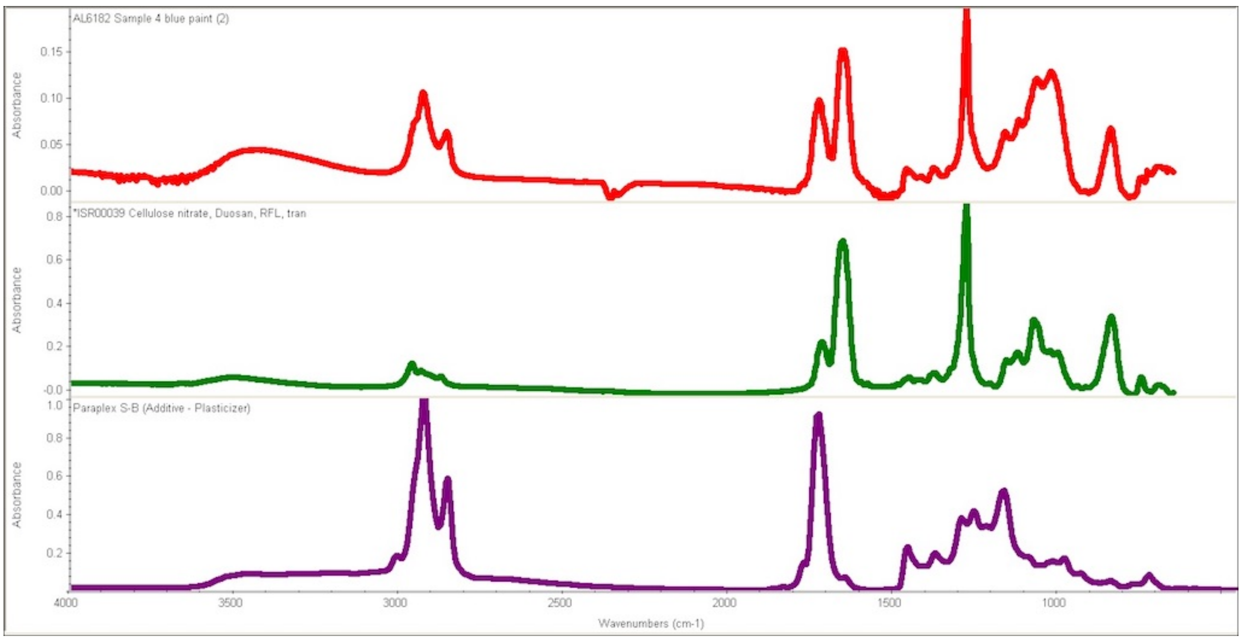


Figure 11. Sample F5, blue lacquer coating, Winterthur Museum GACP1628 (AL6182), shown with reference spectra for cellulose nitrate and a possible plasticizer.

Py-GC/MS further characterized the plasticizer as dibutyl phthalate (DBP) (Fig. 12). According to Dr. Petersen, the chromatogram for the coating also indicated the possible presence of something related to pine resin. Both DBP and resin are expected additives in the production of printing inks. Dr. Petersen also noted cyclic silicones in the chromatogram. It is possible that these silicones are rearranged fragments from the pyrolysis of silanes found in an adhesion agent used in printing inks (Flick 1999, 8) (Petersen 2017).

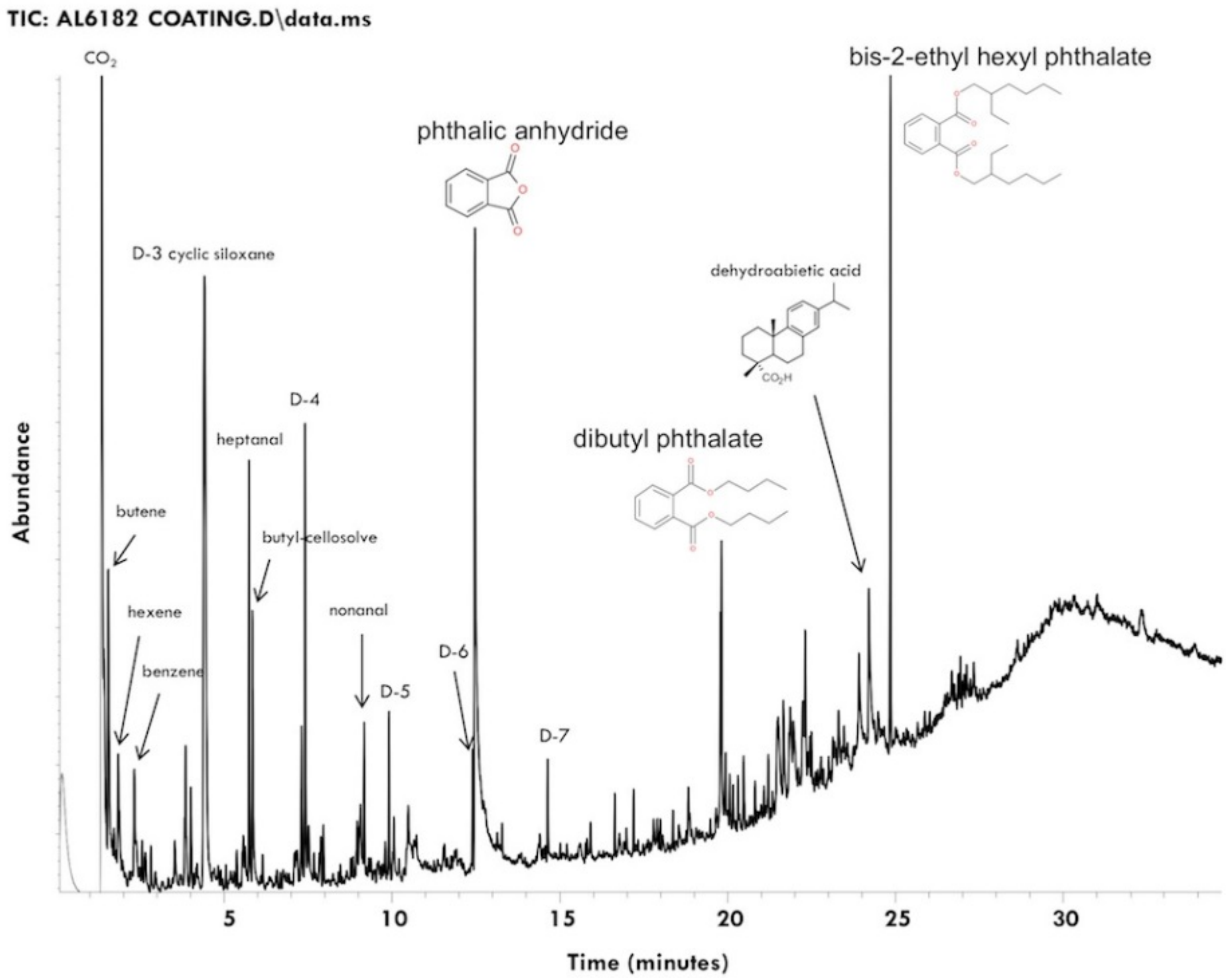


Figure 12. Py-GC/MS of the lacquer coating (c), Winterthur Museum GACP1628 (AL6182). Chromatograms courtesy of Dr. Chris Petersen and Catherine Matsen.

Since nitrocellulose printing inks are manufactured with a variety of additives in proprietary blends and amounts, it is difficult to know how the formulation will affect the aging of the multi-colored coating on *Automata No. 1.* Printing inks can contain dryers, waxes, wetting aids, plasticizers and pigments- all of which change the properties of a coating. The pigments used in the coating were initially characterized through XRF analysis as likely being industrial organic and inorganic pigments (Fig. 13). Using spectra collected via XRF, it is possible to see distinct transitions from the copper based organic blue pigment to an inorganic lead and chromium containing pigment that appears strongest in the yellow sample spot (Fig. 14-15). A decrease in this same lead chromium pigment is visible as the color shifts to orange. There is also a detectable amount of manganese that appears in the topmost red/orange and red cubes (Table 2, Fig. 15b).

Table 2. Summary of XRF analysis performed on cubes

Spot No.	Location/Description	Notable elements detected	Observations
1	Cube substrate	Calcium and potassium	Calcium carbonate and possible potassium silicate based on small amounts of silicon visible in EDS false color map of substrate
2	Grey primer	Barium	After EDS false color mapping indicated presence of sulfur, possibly barium sulfate
3	Blue coating on loose cube	Copper	After Raman was performed, PB 15 was considered a likely colorant
7	Blue/green	Copper, chromium, lead	A possible mix of a copper blue and lead chromate (PB 15)
8	Green/blue	Copper, chromium, lead	A possible mix of a copper blue and lead chromate (PB 15)
9	Green	Copper, chromium, lead	When compared to sample 7, increase in lead and chromium peaks
10	Yellow/green	Copper, chromium, lead	Possible lead chromate
11	Yellow	Chromium, lead	Possible lead chromate yellow pigment
12	Orange	Chromium, lead, manganese	Possible addition of a manganese containing organic red azo pigment
13	Red	Manganese	Possibly a manganese containing organic red azo pigment

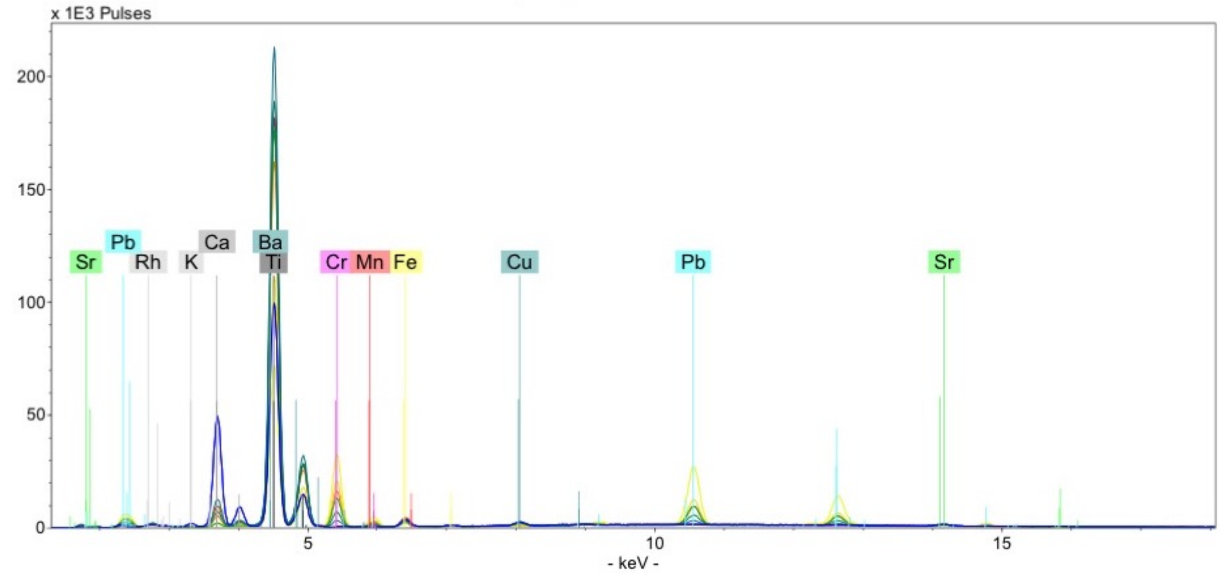


Figure 13. Spots 3 and 7-13, color coded to correlate to color of spot analyzed, Winterthur Museum GACP1628 (AL6182)

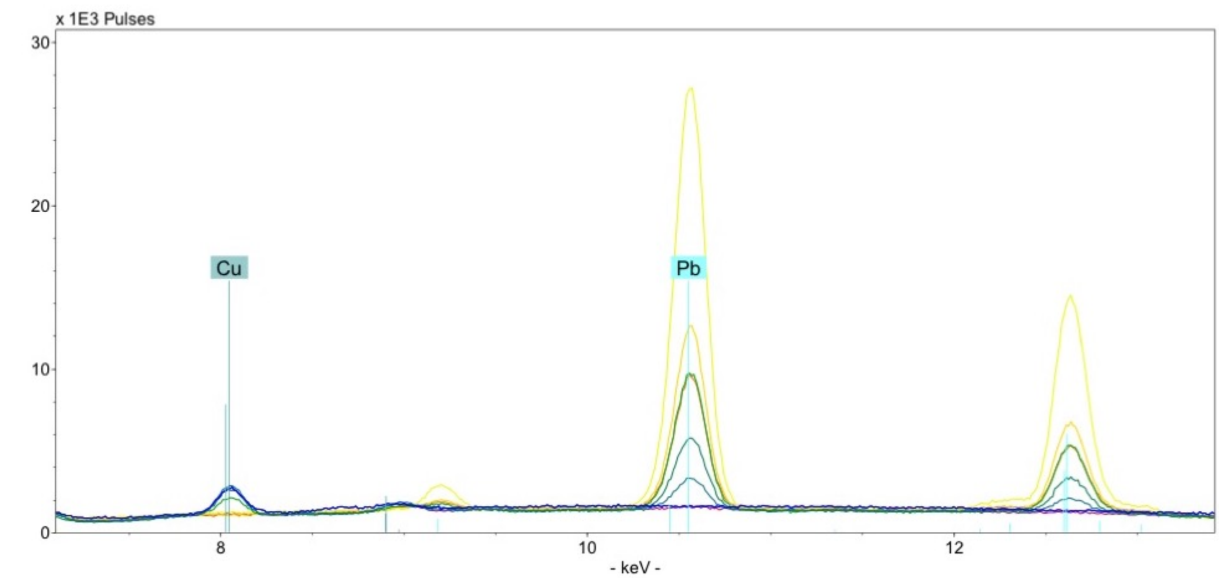
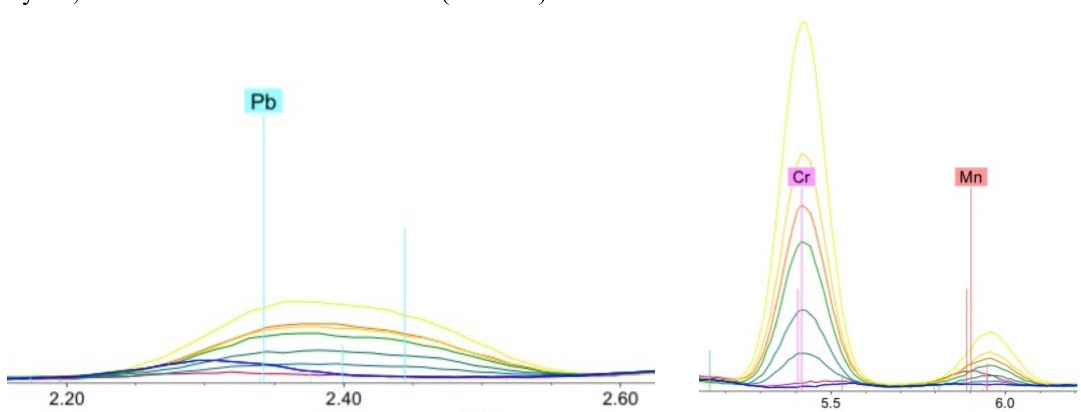


Figure 14. Detail of overlaid spectra for Spots 3 and 7-13. Spectra are color coded to correlate with color of spot analyzed, Winterthur Museum GACP1628 (AL6182).



(a) (b)

Figure 15. (a) and (b) Details of overlaid spectra for Spots 3 and 7-13. Spectra are color coded to correlate with color of spot analyzed, Winterthur Museum GACP1628 (AL6182).

The naming of industrial pigments comes from the Colour Index, which is a coded system derived by the Society of Dyers and Colourists in the United Kingdom, and the Association of Textile Chemists and Colorists in the United States. The C.I. gives identification to pigments through a "Colour Index Name" and "Colour Index Number".

Three of the pigments present were further characterized using Raman spectroscopy. One of these was Pigment Blue 15 (Fig. 16), a copper phthalocyanine blue; Pigment Blue 15 is subcategorized as 15.1-15.6. These differ in hue based on the level of substitution of chlorine or bromine on the outer benzene rings, and can vary in stability as a paint film (Koleske 1995, 198). There is some argument within the conservation science community as to whether the subcategories of Pigment Blue 15 are discernible through Raman spectroscopy.

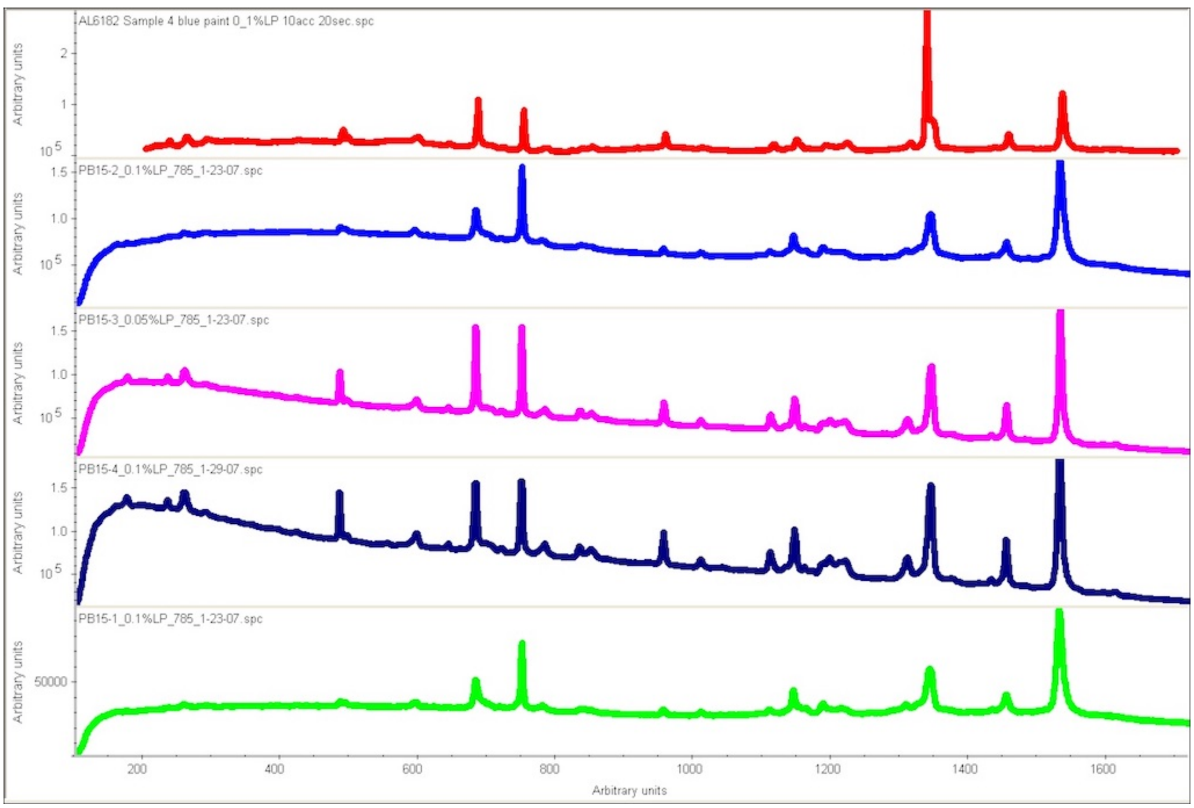


Figure 16. Sample 1, blue lacquer coating, Winterthur Museum GACP1628 (AL6182), shown with reference spectra for PB 15.1-15.4.

Phthalocyanine blues tend to have high pigmenting strength; this might explain one of the previously unexplained trends noticed during XRF analysis of the colored coating. The distinct increase in the amount of calcium present is likely caused by a calcium extender (Fig. 13); it is likely that the calcium present was added as an extender so that the blue matched the intensity of the other colors (Learner 2004, 97). Raman of the yellow sample was consistent with earlier XRF findings, as it was found to be a lead chromate, or chrome yellow. Raman performed on the green sample also confirmed the trend seen in XRF, as it appeared that the copper based PB 15 was mixed with lead chromate yellow to form the intermediate colors. Raman of the red/orange sample yielded similar results, with lead chromate yellow as a component of the orange shades. However, the red pigment used was a bit harder to determine. Since manganese was detected in the red and possibly orange colors during XRF analysis, initially a metallized azo red like Managanese 2B was considered a possible coloring agent. Many red pigments found in the coatings industry are organic, containing an azo chromophore. There are two subsets of azo reds: metallized and non-metallized pigments. Using Raman spectroscopy, the red pigment was characterized as Pigment Red 170, a non-metallized azo Naphthol red. Pigment Blue 15 was also found in the red color; the addition of blue may have been added to shift the hue of the red to a deeper crimson. The remaining mystery is the presence of manganese in the red. Manganese can appear in pigment violets, it is possible that pigment violet was also used to shift the red hue, however Winterthur does not have these manganese containing pigments in their Raman spectra library (Koleske 1995).

Treatment Path – A Debate of Re-fabrication vs. Conserving Original Materials

Without Tyson's input, the challenges we faced regarding treatment were both ethical and technical. Ideally, we would want to know his view on the preservation of the work, his creative process and the reasons behind his selection of materials. Did he intend the sculpture to be permanent, ephemeral, or forever new? To our knowledge, at the time when *Automata No. 1* was created, transience, or the process of deterioration was not conceived by Tyson as a conceptual or symbolic gesture. This gives us confidence that appropriate conservation treatment could be the right course of action. However, as we do not know whether he would see the damages caused by the transit accident and/or Hurricane Sandy as significant events to the history of the sculpture, we want to state that we would respect the artist's wishes in determining the future of the object. For our purpose as students, we moved forward with treatment. However, if at any point, Tyson expressed strong feelings that this piece should not be treated, we would re-evaluate and possibly cease our efforts.

The next question is how to approach the treatment. We are dealing with a surface that is intended to look pristine yet is composed of inherently unstable materials. During our discussions, we started a debate of re-fabrication vs. conserving original materials.

Re-fabrication

There are some instances where the decision to refabricate has been seemingly straightforward. For example, Sol LeWitt's wall drawings are refabricated upon each installation. The right answer regarding replacement is harder to define when dealing with light sources in work by artists like Dan Flavin. In this case, stakeholders have made replacement decisions so that the work can live on despite obsolescence of key materials. When approaching conservation of a work by living artists, we hope to engage them in treatment decision making. What if the artist is living, but just unreachable, as is the case here? Opening the discussion for the refabrication of *Automata No. 1* feels controversial. It is a complicated subject, with a lot of reasons stacked against it. Fully understanding that the artist may have a completely different point of view, in the spirit of bias, we decided to ask ourselves what we find to be the most important aspects of this piece. After discovering through technical analysis and communication with the fabricator that the materials used are likely inexpensive, commercially available products with a short lifetime, we felt strongly that it was not about the materials in this instance.

Instead, the function of this piece seems to be its relationship to the other works in the Geno Pheno series. It is another piece in the genetic puzzle that is Keith Tyson's exhibition at Pace. Visually, its function is straightforward and clean, with calculated arrangements, sharp corners and a pristine finish. *Automata No. 1* currently exists in limbo as a total loss. We have to ask if Tyson's series Geno Pheno is incomplete without this piece. If it is, and if its purpose is as we envision it, then refabrication has to at least be considered. To cite a talk at the IIC Annual Congress in Los Angeles given by Gwynne Ryan, Chief Conservator of the Hirshhorn Museum and Sculpure Garden, it may be appropriate to consider this piece eligible for refabrication as a preservation strategy. Ryan's talk *Considerations in the acquisition of contemporary art: Refabrication as a preservation strategy,* inspired us to consider the importance in setting parameters on refabrication prior to the acquisition of a fabricated work. This action may give the recipient more confidence in accepting a piece composed of fugitive materials. Another challenge to consider is that at some point the materials used in *Automata No. 1* may not be readily available for its duplication (Ryan 2016).

If one thing is certain after an extensive analysis of these materials, it is that each component offers its own, finite lifetime. The nitrocellulose color coating contains extenders, plasticizers, and even resins to increase surface gloss. Each industrial pigment has a potential effect on the cohesive property of this coating as well, with Pigment Blue as perhaps the most stable. To say there are a myriad of interactions possible as each component degrades would be putting it lightly.

Conserving Original Materials

Conservators, along with curators and other museum professionals, have the responsibility to conserve not only the object but also its cultural significance for present and future generations. Artworks in their original states capture the artistic moment and material culture in a certain time and therefore have historical and anthropological values.

Painter Francisco de Goya once spoke about the "historical unrepeatability of the artist's touch (Glanville 2007)," which means that the unity of material and the mind at the instant of the creation generates a unique historical event that cannot be recreated. In the case of *Automata No.1*, the object embodies the collaboration between Keith Tyson and the fabricator, and perhaps also Pace gallery, in 2005. The methods and materials chosen for fabrication could be significant due to the wide availability of certain commercial products and technologies. Without knowing whether the artist's ideas, concepts and thoughts are embedded in his use of materials, replacement of original material could lessen the authenticity of the artwork.

Artists' ideas are changing and evolving all the time. If another fabrication was to be done, the artist might want to incorporate new ideas into the work. The new ideas that are added to an older piece, even contributed by the artist himself, could inevitable make the piece less original.

Roy Perry, former head of conservation at Tate, once said "With contemporary works of art, we have the unique opportunity to conserve them in a state as close to their original condition as their irreversible tendency to decay allows (Perry 1999)." There is still a lot of information we would like to know about the sculpture, its artistic meanings and material stability. By preserving as much original materials as we can, we are allowing our future selves or the next generation of conservators more time for examination, research and new discoveries.

Taking a look at all the preservation issues of the object listed above, they will not disappear with conservation treatment. Our work and continuous research in the field will help us solve those issues one at a time. However, with the condition issues we are presented today, they are challenging, but not impossible.

Treatment Protocol

As there are many uncertainties regarding the artist intent and the future plan for the artwork in terms of its storage and ownership, our approach focused on the reversibility of the treatment without undermining the stability.

Assembly

Due to the materials' sensitivity to solvents, the adhesive choice is limited to water-based adhesives that can be not only dissolved in, but are also reversible with water. Although the nitrocellulose coating is resistant to water temporarily, prolonged exposure will cause damage. Moisture exposure should also be controlled due to the internal ferrous hardware. Our final approach consisted of a barrier layer made of Tengujo paper pre-coated with 10% Aquazol® 200 placed against the polyurethane core, and a blend of 50% 3:1 Paraloid® B72/ Paraloid® B-48N in 90% acetone/10% denatured alcohol bulked with fumed silica as the adhesive for joining the cubes together. This method provided good working properties in both application and reversal. Adhesive squeeze-out can be completely avoided with careful application to minimize any contact with the nitrocellulose surface. The join appeared secure, and a reversal test demonstrated that the paper acted as a successful barrier layer.

Aesthetic compensation testing

While aesthetic compensation was not tested directly on the piece, two possible options besides direct inpainting were considered. One of these was painting or casting out Golden Fluid Acrylics on a surface similar to that of the spray-lacquered cubes. This thin layer of paint would then be left to dry and cut to the shape of a loss. A seam between the two materials may be visible upon close inspection, but it would achieve the surface gloss and color regularity of the lacquered cubes. Options for reversing inpainting is limited with water-born media like acrylic emulsions, unless the compensation is prepared off of the work. Another option would be masking areas of loss and airbrushing using water-based media such as watercolors or Golden QoR Colors.

Conclusion

Going into this project, we hoped that we could communicate with the artist and rely on his opinion in determining the most responsible treatment path for the object. Although we did not achieve this goal, we learned a lot from rationalizing our thoughts and coming together in establishing a course of action. Being a total loss, the object on one hand offers great educational opportunities for us to conduct analysis; on the other hand, we are not sure what it means for the object's future after our treatment. Artist Larry Bell once said: "There is a fragility in everything. But if the artworks are cared for, they are going to be around for a long time" (Getty Conservation Institute 2013). And that is what we hoped for the future of *Automata No.1*.

We titled our paper thinking inside the box because we want to focus on what we know in terms of material assessment in devising a preservation plan for the object. However, in terms of the object's future, we might have to think outside of the box after all. Perhaps this can be a modern installation at Winterthur's famous Chinese Parlor, starting a new conversation about art and value in the new era (Fig. 17).

Figure 17. Digital rendering of *Automata No. 1* in the Chinese Parlor at Winterthur Museum

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