Jorg Immendorff's "Cafe Deutschland Gut": Consolidation with Klucel G and the Engelbrecht Radiant Heat Source

Jonathan P. Derow

INTRODUCTION

This paper consists of two related parts. The first is a description of the treatment of a very large print and the second is a critical examination of the recently published "Evaluation of Cellulose Ethers for Conservation" as it concerns Klucel G.

The print is a color linocut entitled "Café Deutschland Gut" by the German artist Jörg Immendorff[1]. It was printed in 1983 from a single block 70 inches tall by 90 inches long; the colors were applied to the block concurrently. There are ten versions of the print, and ten copies of each version. These are not considered states, per se, because the difference is in the colors used in printing, rather than changes made to the block.

CONDITION

When The Brooklyn Museum acquired "Café Deutschland" in 1984, it was in poor condition[2]. A memo from 1985 noted that the print was in extremely fragile condition, with actively lifting paint and losses and should under no circumstances be exhibited. In 1991 the print was re-examined to determine if it could be successfully treated.

Unfortunately, this work suffers from a severe degree of inherent vice. This is due partly to the significant cockling of the support, but primarily to the incompatibility of the media used by the artist: the under-layer is a pink, solvent-based paint and the linocut layer was printed in a thick, water-based paint. In the heavier areas of the pink under-layer, the water-based paint, similar to poster paint and having a matte finish, was cracking, lifting, flaking and curling, unable to adhere effectively to the solvent-based paint layer below.

The cockling of the support appears to be partly due to the moisture applied to the huge, machine-made sheet during the printing process and partly the result of surgical tape applied by the artist to all four edges on the verso.

While devising a plan of action, other conservators who had "Café Deutschland" prints in their collection were contacted for advice. While many had spent considerable time attempting to consolidate the flaking and curling paint, none felt the treatment had been entirely successful and most had abandoned treatment. One conservator laughed when I said that I was looking into treating the Immendorff, more out of pity than amusement[3].

TAPE REMOVAL

The first step in the treatment was to remove the pressure-sensitive adhesive tape from the verso to prevent future staining and hopefully allow the sheet to relax somewhat. After unsuccessful attempts applying heat and using solvents, the tape was removed mechanically while the print was face up, as the fragile condition obviously prevented it from being turned over.

Solvent treatment to remove adhesive residue was undertaken with a two inch wide portion of the edge of the print hanging over the edge of its original backing so that the tape was accessible from the verso. A Plexiglas strip, approximately six inches wide, was placed on blotters at the edge of the print and weights placed on the inner edge of the Plexiglas. This allowed upward pressure to be applied to the verso without moving the print or damaging the paper. The remaining adhesive was removed from the edges of the verso by swabbing, first with acetone and cotton swabs to remove the bulk of the adhesive, and then with MEK and cotton balls to remove what remained. The action of the solvents left a yellow-brown stain of solubilized adhesive on the paper, both recto and verso.

This staining was removed from the paper on the suction table. Sections of the paper's edge, approximately one foot in length, were treated by positioning the suction table alongside the table on which the print and backing were resting. The portion of the print not on the suction table was supported with Fome-Cor. The stained area was brushed with MEK and then liberally flushed with acetone. This resulted in the removal the staining from the recto, though some staining or discoloration of the paper did remain on the verso.

CONSOLIDATION

Consolidation of the flaking paint required the solution to two problems: how to relax the curling flakes, and what to re-adhere them with. Testing showed that the paint was highly water-soluble, but insoluble in ethanol, iso-propanol, acetone, MEK, petroleum benzine, toluene, and xylene. The pink under-layer, however, was unaffected by water and iso-propanol, but soluble in the other solvents tested. Even a solution of only 5% water in ethanol caused a change in the color and reflectance of the top paint layer. Conservators at the National Gallery of Art reported using humidification to relax the media by breathing through a drinking straw, but this caused a change in the reflectance of the breathed upon area. These tests, and especially blowing through the straw, convinced me that the use of moisture in any form would not be possible.

The application of heat proved much more successful. This was done initially with a Leister hot air gun. The hot air did, however, cause loose flakes to be blown about. The nature of the flaking paint clearly contraindicated the use of a hot spatula. The solution to the problem of requiring heat without hot air or pressure was provided by the Engelbrecht radiant heat source. This tool was developed in Germany for use by paintings conservators and has a number of different attachments, one of which is the radiant heat source, basically a car cigarette lighter on a stick with a rheostat[4]. It was found that the optimum setting was approximately 110°F.

In the hopes of identifying the media in order to make a mock-up to test various consolidants, Immendorff's dealer in Germany was contacted, as was a German conservator who had treated a number of "Café Deutschland" prints. The latter recommended Plexisol (Lascaux P-550), a butyl methacrylate used in petroleum benzine. When tested, it was found that not only was this consolidant very slow drying, but it left a high gloss on the surrounding media. Though this gloss could be removed with a cotton swab dipped in solvent, this caused the adhesive to re-solubilize and the flake to be released. Similar problems were encountered with BEVA, BEVA D8, and Acryloid B-72. As none of the synthetic polymers proved effective, I turned to the cellulose ethers, which was preferable because they are hygroscopic.

Due to the moisture-sensitivity of the printed media previously described, it was necessary to choose a cellulose ether that could be dissolved in a solvent other than water. Initial tests were done with 3% Klucel G and 5% Ethulose solutions, both prepared in alcohol. The Klucel proved more effective, adhering the flaking media easily in one application. Though Klucel left a glossy coating on the surface of the media, this was easily removed with the solvent and a cotton swab without solubilizing the consolidant. The Ethulose was less successful in both respects: it required multiple applications and left white crystals on the media surface after the solvent had evaporated.

While the manufacturer lists many solvents and solvent mixtures which will give a clear and smooth solution, I chose iso-propanol because it wouldn't solubilize the pink under-layer while also being the least toxic of the choices. As Klucel G is insoluble in pure iso-propanol, a small quantity of ethanol, approximately 5%, was added to enhance solubility. Trial and error showed that the easiest way to mix up the consolidant was by heating the solvent solution to approximately 150°F [this should be done in a fume hood] and then slowly adding the Klucel powder while the solution is vigorously stirred, in this case with a magnetic stirrer. Stirring for approximately ten minutes will give an evenly dispersed solution, though the mixture should be left for a few hours to allow the Klucel particles to completely absorb the solvents.

Consolidation was carried out on a flake-by-flake basis. The consolidant was applied with a brush underneath the lifting flake and then heat was applied to soften the flake. After approximately thirty seconds the flake softened and, while still applying the heat, the flake was gently pushed down with the end of a brush or swab stick. When the flake was in place, the heat was removed while light pressure was still being applied to the flake. A few seconds were allowed for the flake to cool in its new position and then the pressure was released. The excess consolidant was removed by swabbing or brushing with iso-propanol. Some areas required repetition of the procedure, and in others the flake cracked. In areas where flakes were detached, or became deta ched when touched, they were removed with tweezers, consolidant applied to the paper, and the flakes replaced. Much of the work had to be done from a bridge[5].

KLUCEL G: CRITICAL ANALYSIS

The second part of this paper is a explanation of my choice of Klucel G in light of the recent classification of this consolidant as "unstable" by Dr. Robert L. Feller and Dr. Myron H. Wilt in their "Evaluation of Cellulose Ethers for Conservation", published by the Getty Conservation Institute in 1990 as Volume 3 of their Research in Conservation series. When I initially looked at their study for information about Klucel G, I went straight to Chapter 7 where the conclusions are presented, rather than wade through the 93 pages of charts, graphs, and documentation that preceded the conclusions. When I found that the authors had given Klucel G an unfavorable rating, I decided to spend the time actually reading and digesting the whole publication. After carefully reading and re-reading, I have come to question their assessment that Klucel G is "unstable" and not appropriate for conservation use.

When examining the research, close attention should be given to which Klucel is being tested, L, G, M, or H. While I understand that the researchers wanted to look at classes of cellulose ethers rather than individual types, previous research quoted in their publication found that "one cannot rely completely on the generic class of cellulose ether to indicate stability [or instability, and that] in any given chemical type, some proprietary products will exhibit a significant difference in stability."[6] In addition, dramatic differences exist between the different Klucels,[7] with Klucels L and G generally out-performing Klucels M and H. A poll of 155 AIC paper conservators, conducted by the researchers, found that Klucel G from Hercules was the hydroxy propyl cellulose used almost exclusively by paper conservators,[8] yet conclusions are presented for Klucels as a class, rating them as unstable.

Feller and Wilt performed a series of laboratory tests with the purpose of ranking six generic classes of cellulose ethers with respect to their thermal and photochemical stability and to project their potential long-term stability under museum conditions. Due to space constraints, it is not possible to present copies of the graphs used by Feller and Wilt. In order to fully appreciate the following discussion it is may be useful to refer to the Figures in "Evaluation of Cellulose Ethers for Conservation". When examining the graphs comparing the performance of Klucel G with that of other water-soluble cellulose ethers, keep in mind the testing conditions and how they compare with typical conservation usage and museum environment.

1. Discoloration and Weight Loss

a. Powders Thermally Aged at 110°C [Fig.6.1, p.65]

The first group of tests was an assessment of discoloration and weight loss when cellulose ethers were thermally aged at 110°C. Results for Klucel G are not presented here, but both Klucel M and Klucel H discolored significantly. Methocel did not discolor at all.

b. Films on Glass Thermally Aged at 90°C [Fig.6.4, p.68]

Two percent solutions of the cellulose ethers were applied to glass slides. After being thermally aged for 700 hours at 90°C, films of Klucel L and G were found to be clear and transparent while Klucels M and H were less so. The graph shows that Klucel G discolored less than Whatman filter paper, as did most of the other water-soluble cellulose ethers tested.

c. Films on Paper Thermally Aged at 90°C [Fig.6.7, p.72]

When applied as a size on filter paper, as a solution in both in water and ethanol, Klucel G showed less discoloration after dry oven aging than the filter paper. Cellofas proved less stable than the filter paper.

d. Films on Paper Light Aged at 23.5°C and 50% RH

When light aged at room temperature in a constant environment room, the samples on filter paper performed as well as filter paper alone.

2. Peroxide Formation

The second group of tests measured the amount of peroxides released by solutions of the cellulose ethers after the powders were dry and humid oven aged. The researchers concluded that none of the water-soluble cellulose ethers released any peroxides.

3. Fall in Intrinsic Viscosity During Accelerated Aging

a. Powders Thermally Aged at 90°C [Fig.6.10, p.80]

Powders were first dry oven aged and then dissolved as a 2% solution in water and the intrinsic viscosity of the solutions tested. A decrease in viscosity indicates chain breaking and degradation. Klucel G was not used for this test, but the viscosity of Klucel L fell more rapidly than that of the carboxy methyl cellulose.

b. Films on Glass Light Aged at 23.5°C and 50% RH [Fig.6.12, p.81]

Films of the cellulose ethers were prepared on glass slides and aged under daylight fluorescent lamps at ambient temperature and humidity. Again, Klucel G was not tested, but Klucel L showed no loss of viscosity and carboxy methyl cellulose performed likewise.

4. Fall in Brookfield Viscosity During Accelerated Aging

a. Powders Thermally Aged at 90°C [Fig.6.20, p.87]

The final group of tests measure the Brookfield viscosity of aged cellulose ethers. These tests are basically the same as those done for intrinsic viscosity, but the measurements are done differently and more accurately. The graph shows that once again, when it was dry-oven aged, Klucel G performed poorly compared with Cellofas and the other cellulose ethers. This result is similar to the first test where the powders were dry-oven aged and the Klucels turned brown. This test simply reconfirms the visual results of that first one where the powders discolored when heated. Incidentally, this was the graph published in the Getty Newsletter.[9]

b. Films on Glass Light Aged at 23.5°C and 50% RH [Fig.6.23, p.92]

Films of the cellulose ethers were again prepared on glass slides and then aged under daylight fluorescent lamps at ambient temperature and humidity.

The films were then solubilized and their viscosity measured. This graph shows that Klucel G performed as well as with Whatman filter paper (the lines have similar slopes).

CONCLUSIONS

I would like to suggest that in all the tests conducted on thin films of Klucel G under conditions of temperature and humidity that might be encountered in a museum environment, Klucel G performed as well as methyl cellulose and carboxy methyl cellulose, and as well as or better than the pure cellulose of Whatman filter paper [Fig. 6.22, p. 91]. Admittedly, in those tests which relied on powders which were dry oven aged, Klucel G fared poorly. You can see in Figure 6.22 that when the change in Brookfield viscosity of Klucel G from the different tests are compared, the thermally aged powder drops right off, the thermally aged film drops initially and levels off and the film that was light-aged at ambient temperature and humidity was relatively stable. It would seem to me that when attempting to predict the future behavior in a museum environment, the tests done with films of Klucel G aged at ambient temperature and humidity would be the best predictors of future performance, suggesting that Klucel G is a cellulose ether which is stable for use as a consolidant or adhesive by paper conservators.

ACKNOWLEDGEMENTS

I would like to thank The Brooklyn Museum and the Getty Grant Program for supporting both my internship in general and this project in particular, and also Antoinette Owen for sticking me with this unusual and challenging project and encouraging me along the way.

NOTES

[1] Color reproductions of the full "Café Deutschland Gut" series can be found in "Jörg Immendorff, Café Deutschland Gut, Linolschnitte 82/83" by Maximilian Verlag and Sabine Knust (Munich 1983).

[2] The Brooklyn Museum 84.241.

[3] I would like to thank all those conservators who were so kind as to discuss this project with me and show me the Immedorff in their collection, including conservators at MoMA, SFMoMA, The National Gallery, and the Tate Gallery.

[4] Available from Conservation Strategies, PO Box 2032, Bala Cynwynd, PA 19004, (215)844-7742.

[5] The treatment I have described here may or may not work with the "Café Deutschland" print in your collection. Each group of 10 prints has a different under-layer and set of colors used for printing, and even within a group the colors may differ somewhat.

[6] Feller and Wilt, "Evaluation of Cellulose Ethers for Conservation" The Getty Conservation Institute, 1990, p. 40.

[7] Ibid., p. 58, Table 5.1.

[8] Ibid., p. 102.

[9] "Cellulose Ethers Show Markedly Different Aging Properties" The GCI Newsletter, Winter 1988, vol. 3, no. 1, p.7.

Jonathan P. Derow, Project Paper Conservator, The Brooklyn Museum, 200 Eastern Parkway, Brooklyn, NY 11238, (718)638-5000 x275.