The Use of Gellan Gum on Albumen Photographs

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Introduction
Albumen photographs are susceptible to cracking within the albumen layer when exposed to moisture. Due to this, any necessary aqueous treatments must be carefully considered as they may irreversibly alter the photograph. Previous studies conducted by Paul Messier, Timothy Vitale, and others have studied increase of cracking as a result of aqueous immersion. It was found that the use of ethanol in immersion baths helped minimize cracking. This project studies the possibility of using both high acyl and low acyl gellan gum as an alternative cleaning method in an attempt to minimize cracking. Low acyl gellan gum is commonly used by paper conservators due to its rigidity and translucency. High acyl gellan gum is less rigid, opaque, and solvents such as ethanol can be added to it. Variations in concentration and composition of the gellan gum were used in this project.

Method
- Gloss measurements and photographs taken of 16 historic albumen photographs
- Samples humidified and removed from their backing.
- Gloss measurements were taken upon drying
- Four samples each were treated with:
  - 4% percent low acyl gellan gum
  - 3% percent 1:1 mixture of high and low acyl gellan gum
  - 5% percent high acyl gellan gum
  - 4% percent high acyl gellan gum containing 1:1 water and ethanol
- Gloss measurements were taken after treatment of samples
- Gellan gum was analyzed using FTIR to look for albumen proteins
- Cracking measured using Photoshop

Results and Discussion
- Degradation products visibly drawn out of all 16 samples
- Visual analysis and gloss meter readings show gloss decreased in twelve samples
- Crack length and width increased in all sixteen samples
- Crack length and width had least increase in samples treated with gellan gum containing 1:1 ethanol and water
- Gloss increased in samples treated with ethanol in gellan gum

Preliminary Conclusions
- Exact measurements of crack increase is pending
- No albumen proteins found in any samples
- High acyl gellan gum with ethanol may be an effective treatment, but gloss increase requires further study

Select References

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Cracking in sample before treatment with 3% 1:1 low and high acyl gellan gum
Cracking in sample after treatment with 3% 1:1 low and high acyl gellan gum
Cracking in sample before treatment with 4% high acyl gellan gum and 1:1 water and ethanol
Cracking in sample after treatment with 4% high acyl gellan gum containing 1:1 water and ethanol
Treating a sample set with 4% low acyl gellan gum
Treating a sample set with 4% high acyl gellan gum with ethanol