Material cues from the past:

Experimentally testing a historical description of material rendering

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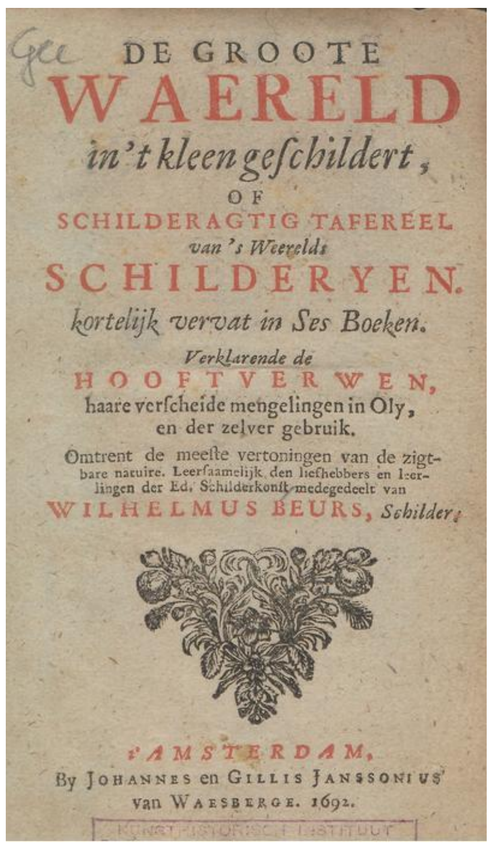
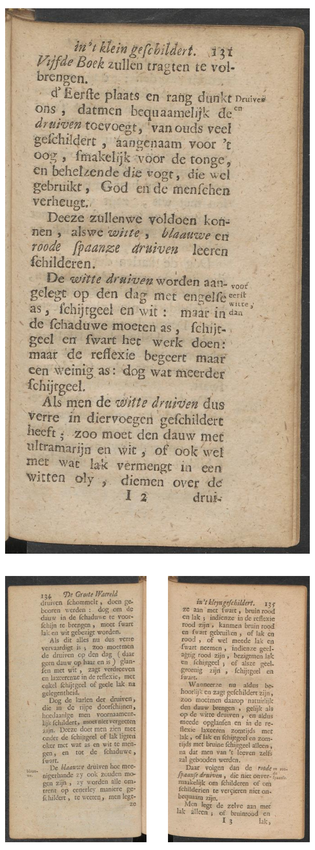
In the 17th century, in this treatise, Willem Beurs described recipes for painting the world convincingly.
Full book (in Dutch): tinyurl.com/willem-beurs


DE GROOTE
WAERELD
in't kleen geschildert,
OF
SCHILDERAGTIG TAFEREEL
van 's Weerelds
SCHILDERYEN.
kortelijk vervat in Ses Boeken.
Verklarende de
HOOFTVERWEN,
haare verscheide mengelingen in Oly,
en der zelver gebruik.
Omtrent de meeste vertoningen van de zigtbare natuire. Leerzaamelijk den liefhebbers en leerlingen der Ed. Schilderkonst medegedeelt van
WILHELMUS BEURS, *Schilder;*
't AMSTERDAM,
By JOHANNES en GILLIS JANSSONIUS
van WAESBERGE. 1692.


in't klein geschildert. 131
Vijfde Boek zullen tragten te volbrengen.
d' Eerste plaats en rang dunkt Druiven ons, datmen bequaamelijk de *druiven* toevoegt, van ouds veel geschildert, aangenaam voor 't oog, smakelijk voor de tonge, en behelzende die vogt, die wel gebruikt, God en de menschen verheugt.
Deeze zullenwe voldoen konnen, alswe *witte*, *blaauwe* en *roode spaanze druiven* leeren schilderen.
De *witte druiven* worden aangelegt op den dag met engelsse as, schijtgeel en wit: maar in de schaduwe moeten as, schijtgeel en swart het werk doen: maar de reflexie begeert maar een weinig as: dog wat meerder schijtgeel.
Als men de *witte druiven* dus verre in diervoegen geschildert heeft; zoo moet den dauw met ultramarijn en wit, of ook wel met wat lak vermengt in een witten oly, diemen over de

Based on this treatise we defined seven 'visual cues' that a realistic grape should require according to Willem Beurs.

Method

Research Question:
Do the Beurs visual cues contribute to convincingness, or to other perceptual qualities?

Experiments
In two experiments participants were asked to report 1) if the visual cue were present, by responding "yes" or "no" (exp. A) , and 2) to rate perceptual qualities (Convincingness Translucency, Bloom, Glossiness) on a 7 point scale (exp. B). Both experiments used 81 sections of paintings depicting grapes as stimuli.

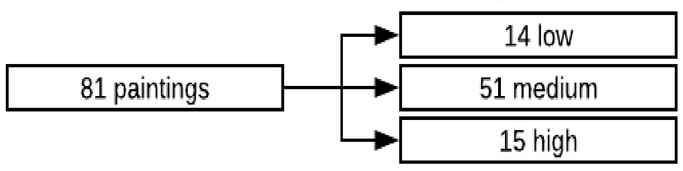
Participants
Exp. A) 70 participants from Amazon Mechanical Turk; 10 participants for each of the 7 visual cues.
Exp. B) 9 participants tested in the lab.

Hypothesis
Combinations of visual cues predict the perceptual qualities.

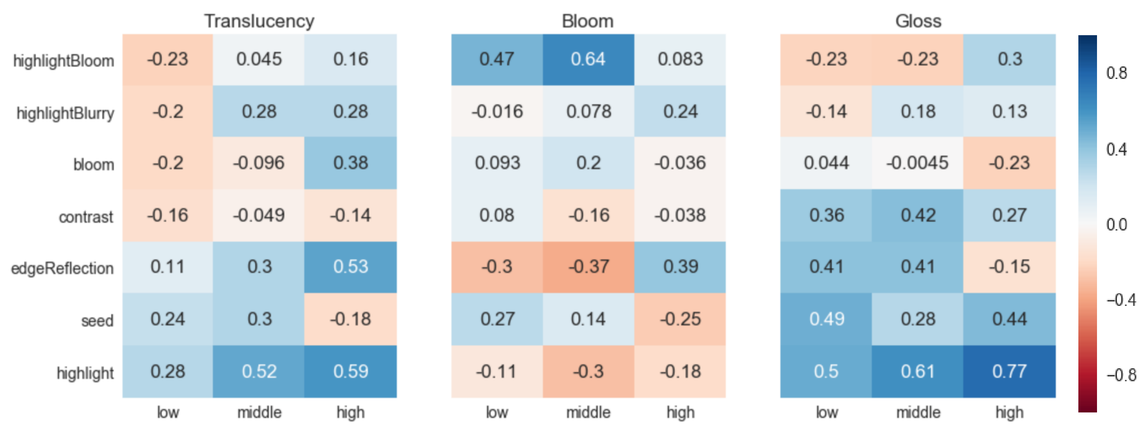
General results

Via generalized linear models we found that the presence of the 7 visual cues did not linearly predict **convincingness**, while the perceptual quality t**ranslucency** was partially predicted by the presence of two visual cues: *edge reflection* and *highlights located where there is no bloom*. The latter was also a predictor for the perceptual quality **Glossiness.** The visual cue *Bloom* was the only predictor for the perceptual quality **Bloom.** To dig deeper, we subdivided the set of paintings by convincingness.

Subdivision of paintings on convincingness score



Correlations between visual cues and perceptual qualities for low/medium/high convincing paintings:

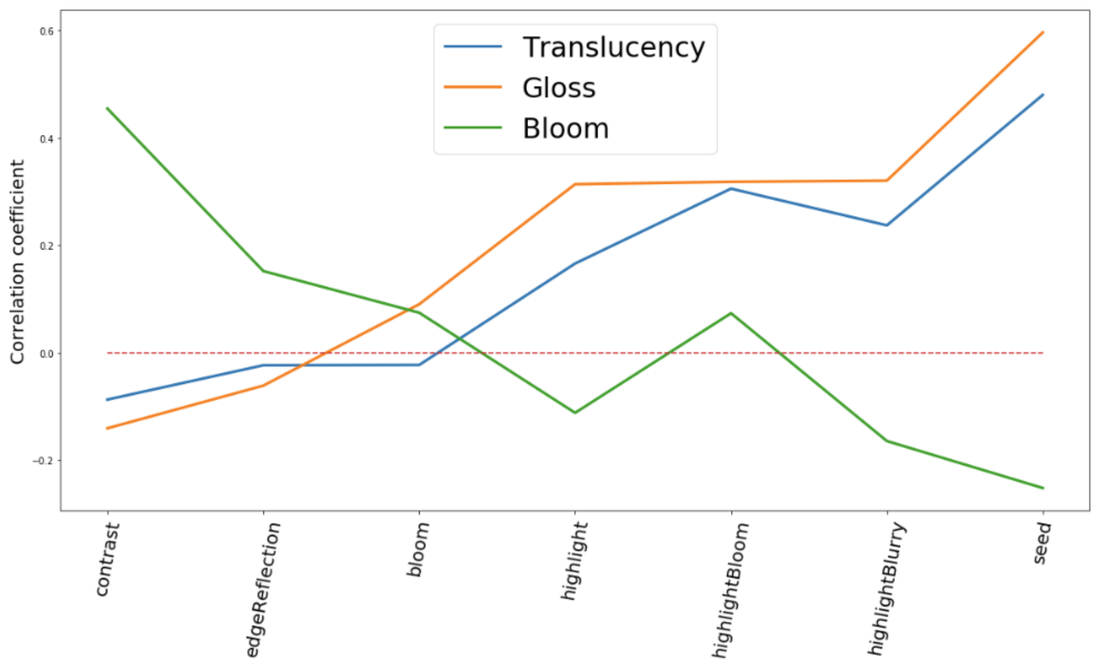


The correlations appear to be affected by the subdivision. This implies that the visual cues do have a more complex relationship with convincingness.

Additional results

We found that the correlations between the perceptual qualities glossiness, translucency and bloom were very consistent.

Rank-order correlations between perceptual qualities and the 7 visual cues plus 4 qualities.



Correlations between the perceptual qualities

$r_s(79)$ =	Translucency	Gloss
Gloss	.64	
Bloom	-.28	-.40

Conclusions

We found that the seven visual cues do not predict **convincingness.** However, when we split the paintings on convincingness we see that the correlations between the visual cues and the perceptual qualities are affected. Possibly the *presence* of visual cues do not predict convincingness because it does not take the *quality* of the cue into account.

The **perceptual qualities** are correlated to the visual cues, with **glossiness** and **translucency** being positively correlated and having a negative correlation with **bloom**.

Our finding suggests that painters from this era possessed implicit knowledge about triggers for material depiction that are remarkably similar to midlevel cues explored in contemporary research on material perception.

References

Beurs, W. (1692) *De groote waereld in 't kleen geschildert, of schilderagtig tafereel van 's weerelds schilderyen, kortelijk vervat in ses boeken, verklarende de hooftverwen, haare verscheide mengelingen in oly, en der zelver gebruik.* Amsterdam, Netherlands: Janssonius van Waesberge.

Paintings:
De Heem, J. (1650-1660). *Garland of fruits and flowers.* Het Mauritshuis, Den Haag.
Obermanm A. C. (1830). *Still life with fruit in a terracotta dish.* Het Rijksmuseum, Amsterdam.

Acknowledgement

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