

# Abstract for the EMPG 1999 Meeting in Mannheim

## On the Illumination-Invariance of Plateau's Midgrey

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In 1872, M.J. Plateau provided each of eight artists with a white and a black disk and instructed them to return to their respective studios and paint a grey disk in appearance midway between the two. Although the illumination conditions may have differed substantially across the studios, the resulting disks were virtually identical. Surprisingly, this remarkable result plays no significant role in current research on the perception of achromatic colors. Experimental as well as theoretical work nearly exclusively relies on cross-context indifference, but does not make use of a midgrey operation. On the other hand, J.-C. Falmagne has developed a formalization in which the invariance reported by Plateau leads to a specification of the form of the psychophysical function. The theory, however, is based on an assumption which may be valid in complex scenes, but usually is contradicted by experimental data. It is shown that Falmagne's approach can be generalized to apply to standard experimental situations. Within the presented formal framework, the impact of illumination-invariance on the possible form of the psychophysical function can be determined via functional equation techniques. In an experimental study, using decremental stimuli in simple center-surround configurations, the illumination-invariance of the midgrey operation turns out to hold for 5 out of 12 subjects. To account for the observed deviations we suggest a more general condition, called near-miss-to-illumination-invariance, which receives support from reanalysing the data of a classical experiment.