

Quote from the Walter Isaacson Book on Leonardo Da Vinci:

The shadow under her nose is subtler. The greatest intensity of light, as Leonardo demonstrated in his optics studies, comes when a beam hits a surface head-on rather than at an oblique angle. This occurs on the top of Cecilia's left shoulder and right cheek. The illumination levels on the other contours of her face are done with delicate precision according to formulas he had developed for the proportional

variations of light intensities at various angles of incidence. His scientific understanding of optics thus enhanced the three-dimensional illusion of the painting. Some of the shadows are softened by reflected or secondary radiance. For example, the lower edge of her right hand catches a glow from the ermine's white fur, and underneath her cheek the shadow is softened by light reflected from her chest. "When the arms cross in front of the breast," Leonardo wrote in his notebook, "you should show, between the shadows

Clearly a manual approach to Ray-Tracing. [See Frau Dulent's notes on the subject.](#)