Light rays interactively playing in pseudo 3D space. Rev.1 rel.2 HAR 2024

(Or: **How Leonardo Da Vinci invented ray tracing** without naminging it as such.)

While reading Walter Isaacson's biography of Leonardo Da Vinci I realized from the description of Leonardo's struggle with his designs about the painting "The Adoration of the Magi" (Page 77 to page 81 of Simon and Schuster's paperback edition 2017) that Leonardo was struggling with the same issues that arise in raytracing and 3D design in all the contemporary 3D computer programs.

" According to the art historian Francesca Fiorani. "Unlike any other artist, he could not ignore an optical problem. It was an unnerving set of iterative tasks. All thirty characters had to reflect light and project shade that would influence, and be influenced by, the light and shadows of those around them. They also had to initiate and reflect emotions, which in turn affected, and were affected by, the emotions emanating from those around them. "

There was another reason, one even more fundamental, that Leonardo did not complete the painting: he preferred the conception to the execution. As his father and others knew when they drew up the strict contract for his commission, Leonardo at twenty-nine was more easily distracted by the future than he was focused on the present. He was a genius undisciplined by diligence.

In a way Leonardo invented raytracing without giving it its name. Of course Leonardo immediately, and logically, took his observations beyond the immediate **ray-tracing** problems into interactive **body language tracing** and even beyond that into **psychological interaction tracing** of his actors. He wanted the bodies in his imprimatura (the under painting) to respond to one another's body language and ultimately into their psychological response to one another. He actually aimed to go beyond the light rays into interactive body language tracing and further yet made an attempt at ***psycho-response-tracing*** among the actors, he wished to relay their respective responses to one another's state of minds interactively. Too many tasks, too many details, too much interaction to depict, or to even sort out. He realize that this was too much to handle, as response and reactive response would be impossible to effectively sort out. More than anyone, even a computer program could handle as the back and forth between individuals would subtly and asymptoticly stretch into some sort of interactive infinity. He found himself defeated by the problem of where to draw the line and above all how to show these interactions 3D while in the 2D environment of a canvas. **This might a problem that could truly be tackled by AI and a quantum computer.** Let me add that this is the first incident where I see that AI coupled with quantum computing could actually produce something culturally useful.

A few words about raytracing: From what I can gather it concerns itself with rays bouncing off of surfaces and traces the individual rays as they further strike other surfaces and so on. The methods keep track of these interactions. Keep in mind that not all surfaces are flat and when it comes to reflective surfaces images they form images in optical space below the immediate surfaces; e.g. not just at the surfaces but below and above the surfaces creating images governed by the focal lengths of the various curvatures making a true 3D illusion vastly more complex. Perhaps this is why computer generated synthetics always look a bit stale.

“The Adoration of the Magi” 1481, oil on wood, 246x243cm currently at the Uffizi Gallery in Florence.