Ray Tracing II

For ray tracing, we have an equation like the following for computing intensity along a ray:

$$I = k_a I_a + k_d I_d (n.l) + k_s I_s (r.v)^n + k_r I_r + k_t I_t$$

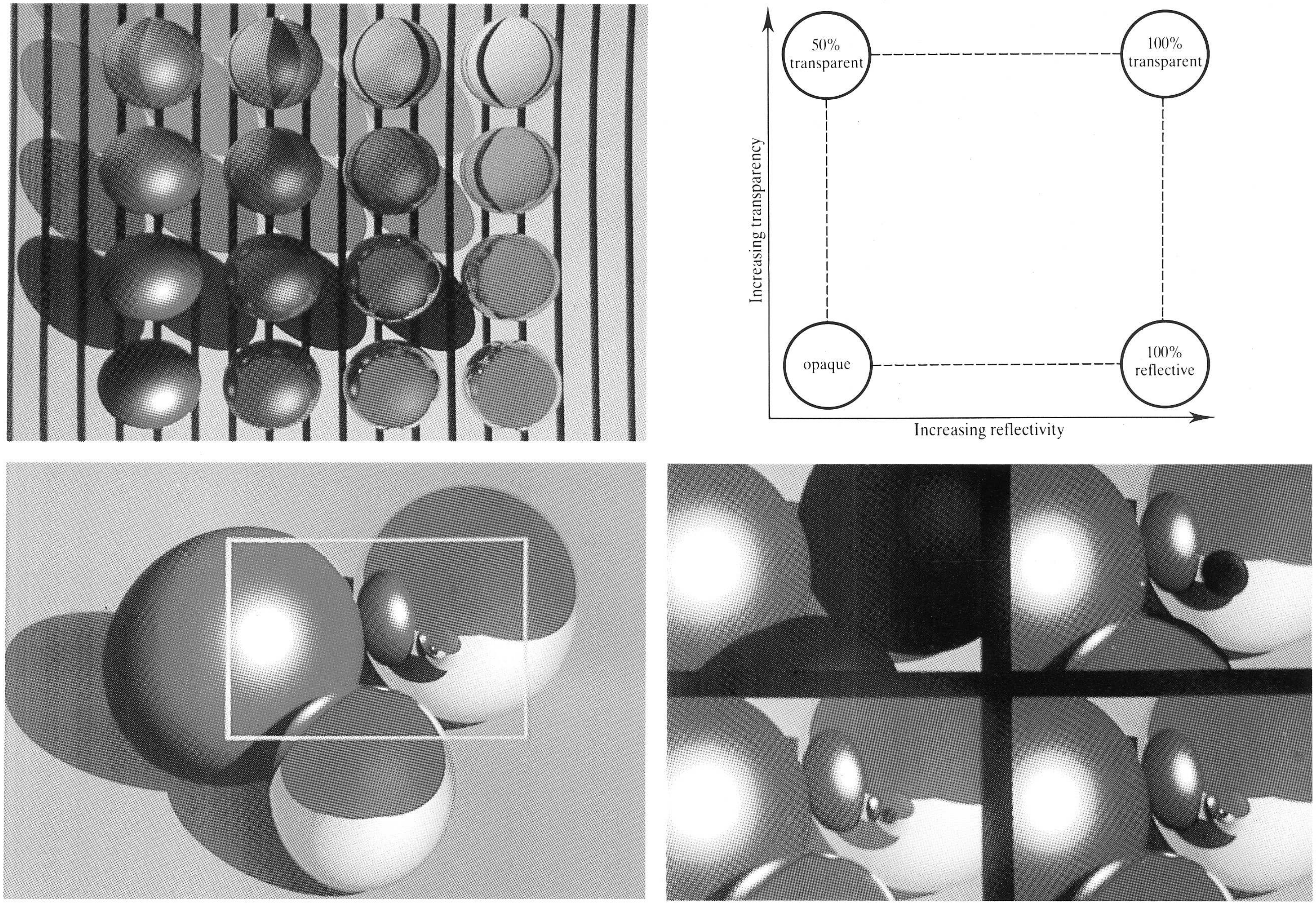
ambient, diffuse, and specular contributions of light sources

recursively computed reflection

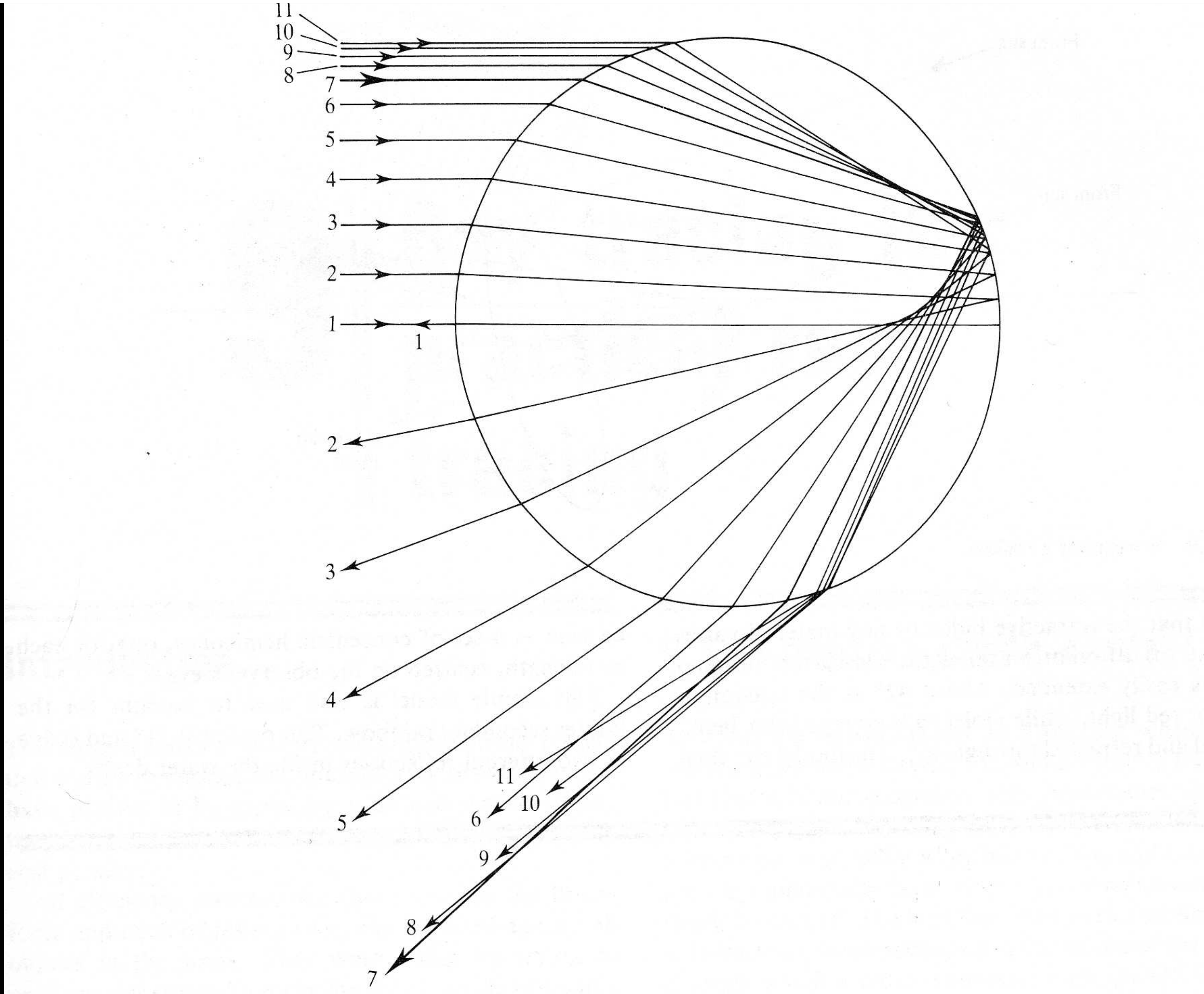
recursively computed transmission

The next slide (top half) shows a tradeoff between k_r and all other parameters on the horizontal axis and between k_t and all other parameters on the vertical axis. The diffuse color of the ball is red. The ceiling is blue.

The bottom half of the slide shows the effect of ray tracing to different depths.



32 Ray tracing spheres. (*top*) Reflective and refractive spheres against a striped background (after an illustration by Apollo Computers). (*bottom left*) Ray tracing to a depth of 6. (*bottom right*) Part of the above image traced to a depth of 1, 2, 3 and 4.



Some argue that ray tracing was invented by Descartes in 1637. He described how rays would propagate through a spherical raindrop, producing a concentration of light at an angle of 42 degrees as shown here.

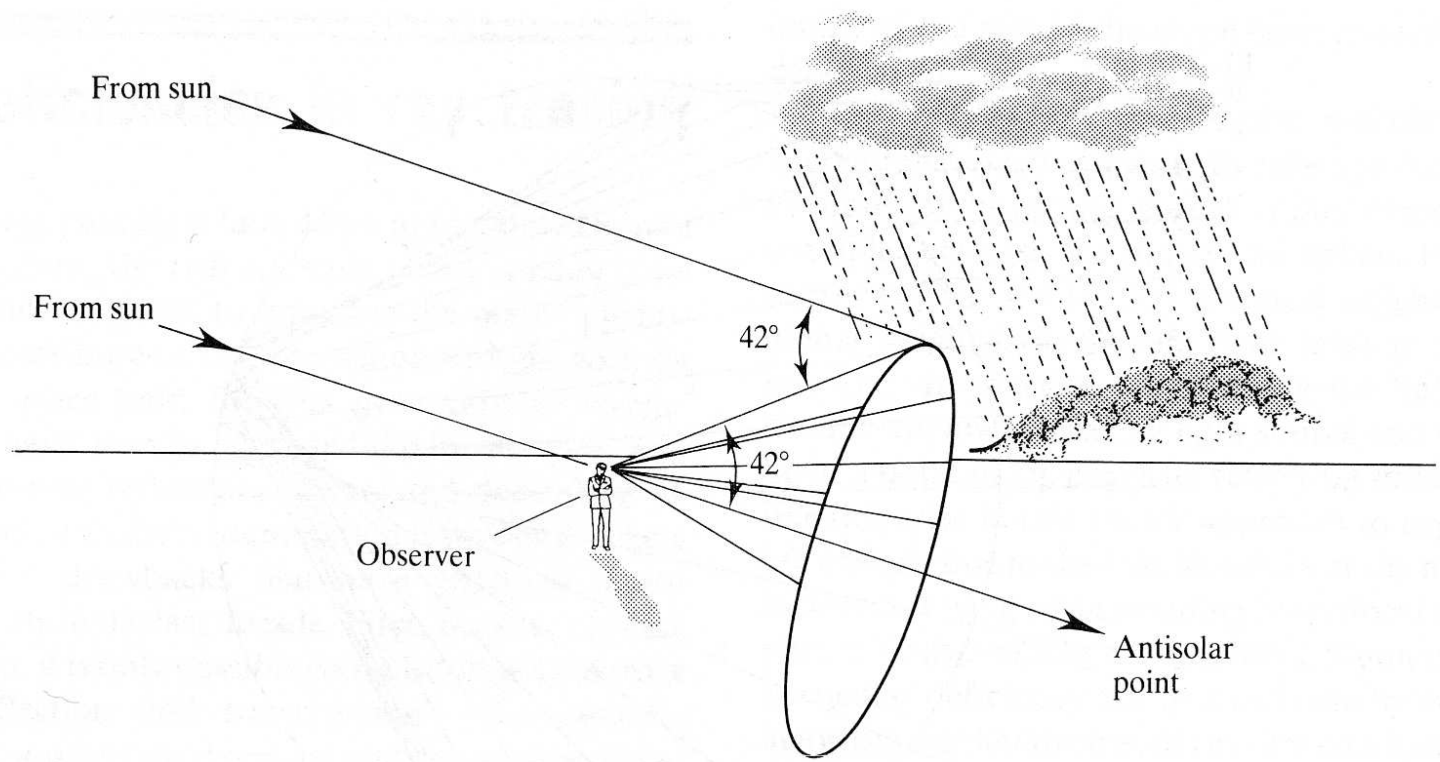


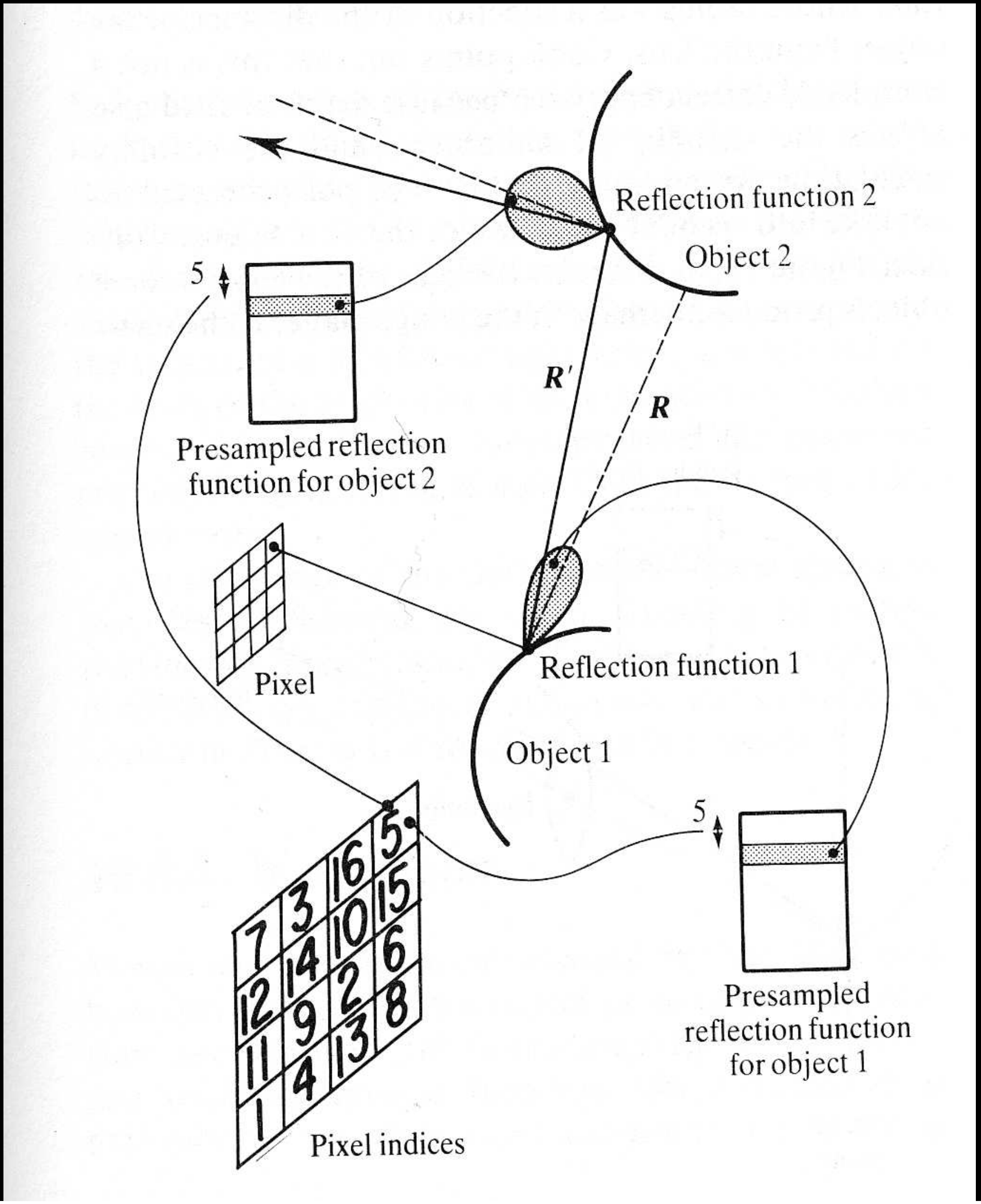
Figure 8.8 Formation of a rainbow.

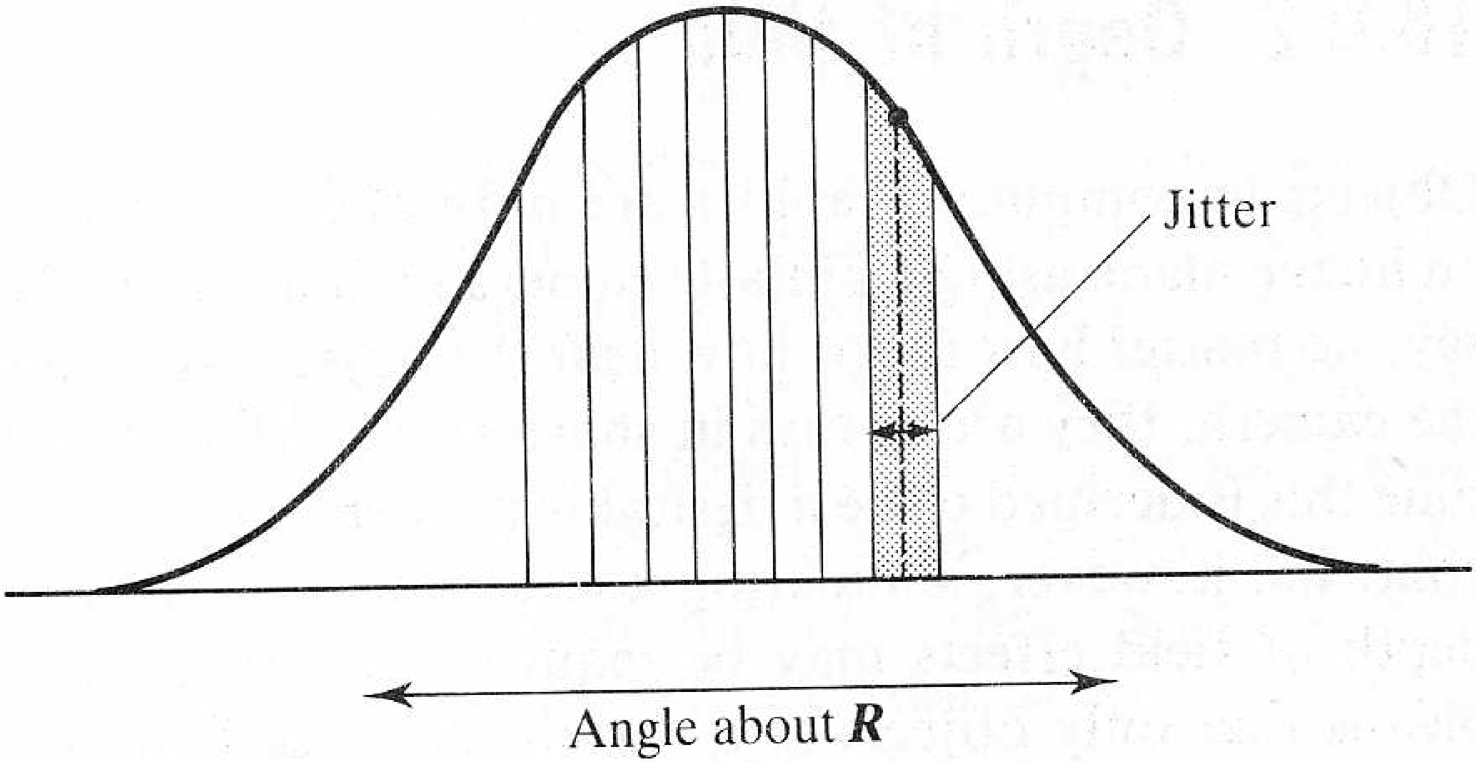
The resulting rainbow effect.
Color separation comes from different indices of refraction at different wavelengths.

Four slide summary of pixel subsampling and distributed reflection in Cook's 1984 distributed ray tracing algorithm.

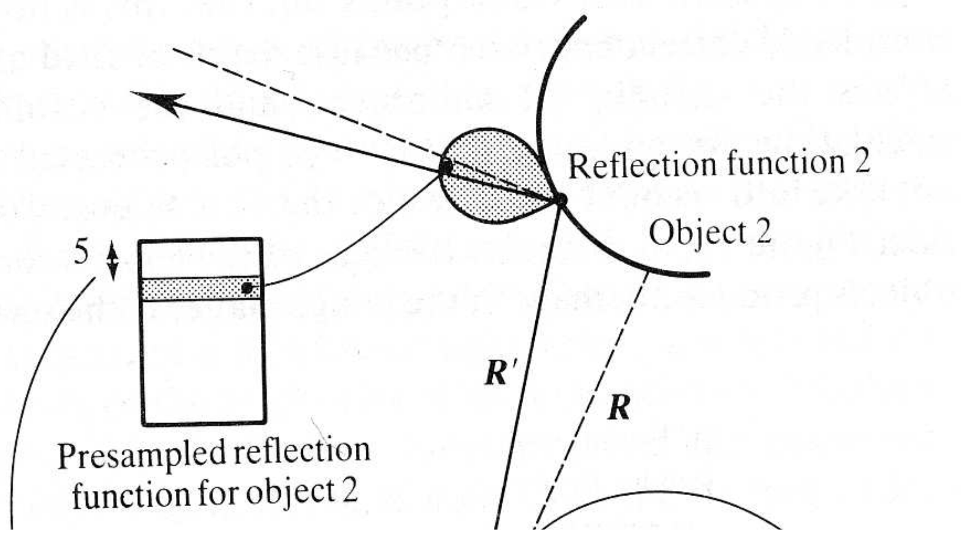
Check out the paper itself (CMU only) at /afs/andrew/scs/cs/15-462/papers/cook84.pdf

You can also get it from the ACM digital library www.acm.org/dl

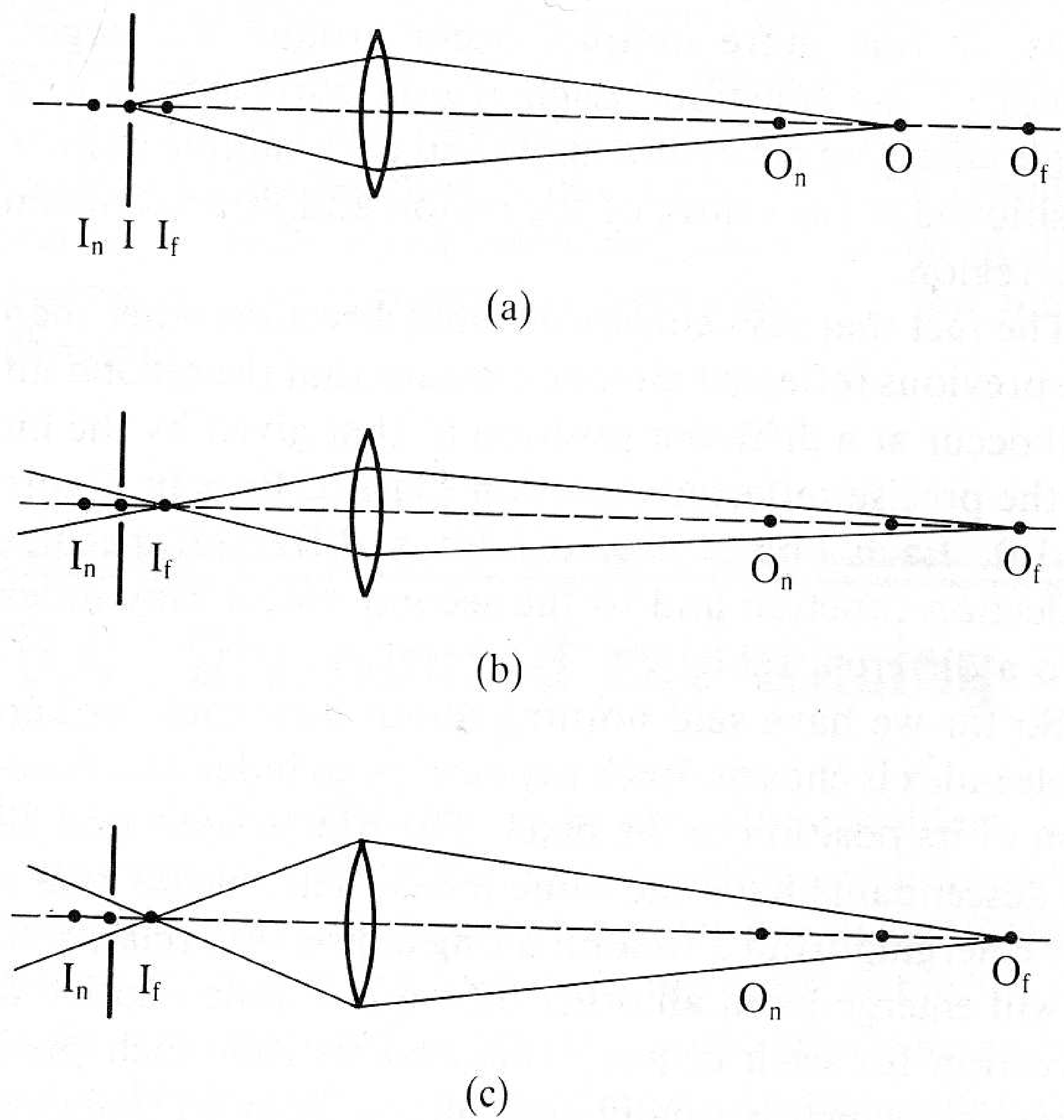




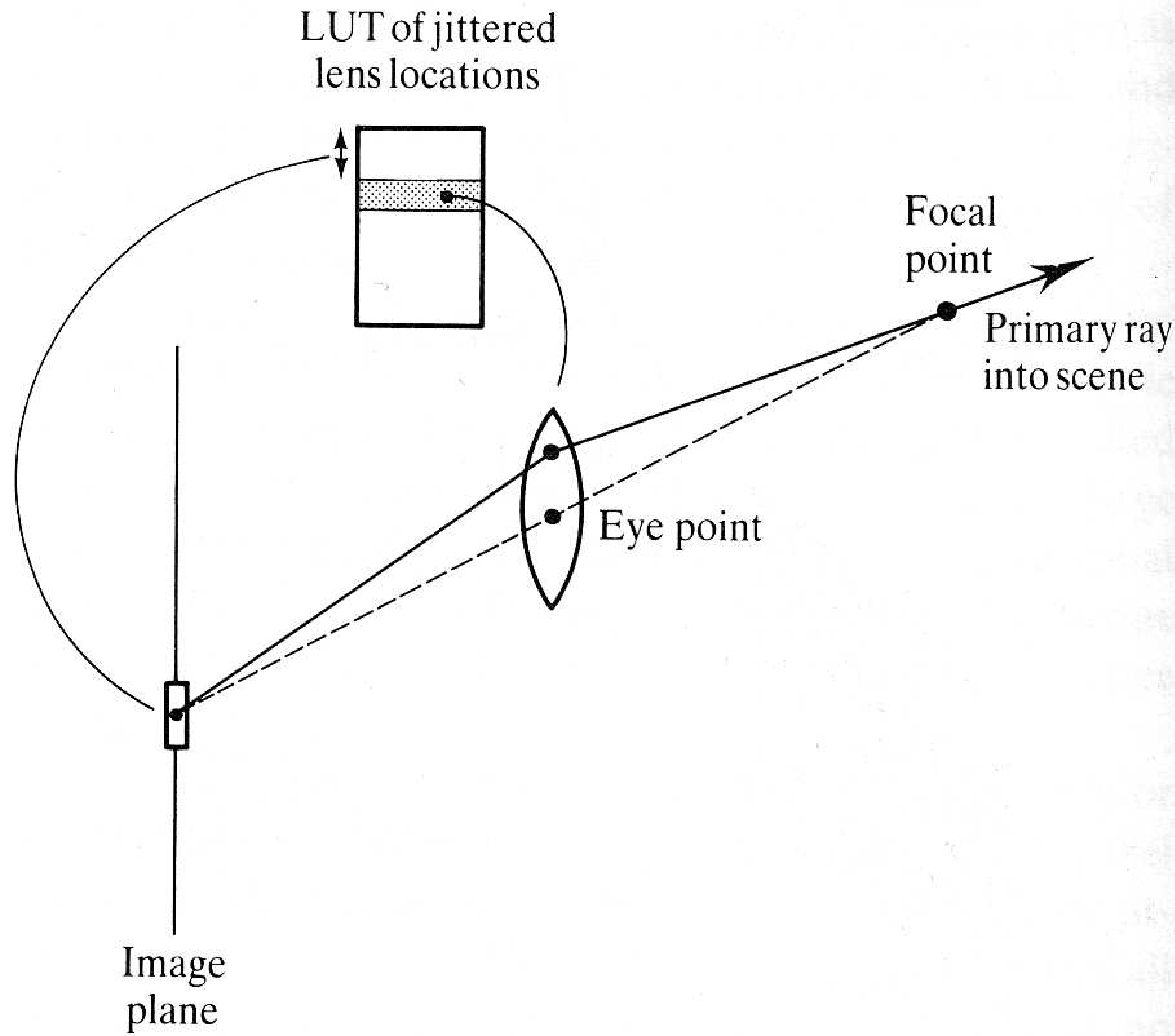
Parameters such as reflection directions are selected based on the index of the outgoing ray and then jittered randomly within a prespecified area



Here is a sketch of how the physics of a camera lens can create depth of field effects. Point O is at the focal distance.



In a distributed ray tracing scheme, depth of field effects can be created using a model of a lens. Locations where the light ray passes through the lens are jittered.



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