

Section 10. Light Bending in CUWF: Path Preference Without Force

The next major test of the CUWF gravity mechanism is light. If gravity is not a primitive force, and if the field $g(x)$ is the slope of a generated landscape, then one of the most familiar relativistic phenomena must be reinterpreted accordingly: why does light curve?

The standard answers are well known. In General Relativity, light bends because spacetime is curved and null geodesics follow that curvature. In everyday Newtonian intuition, people often imagine light as being pulled. CUWF proposes a different reconstruction. Light bending is neither evidence of a force acting on photons nor a standalone mystery of geometric decree. It is the visible trace of path preference in a non-uniform generated landscape.

10.1 Reframing the Problem

The central shift of this section is simple but decisive. For matter, the generated landscape produces descent tendencies. For light-like modes, the same landscape is read not primarily as a source of mass-dependent pull, but as a field of structured propagation accessibility.

Light bending is therefore not interpreted as a force on a massless particle. It is interpreted as the macroscopic record of how propagation pathways are selected in a landscape whose accessibility varies from place to place.

At the principle level, the CUWF statement is this: the landscape Φ^E shapes accessibility and effective propagation cost, and a light-like mode follows the pathways most compatible with that accessibility structure. The observed curvature is the geometry of preference, not the signature of a pulling agent.

10.2 Effective Refraction Analogy

A powerful intuition for this already exists in ordinary optics. A light ray curves when it moves through a medium whose refractive index varies with position. The ray is not pulled sideways by a force. It continuously adjusts because local propagation conditions vary.

CUWF adopts the same logic, but the relevant medium is not glass or air. It is the generated entropic or collapse landscape itself. That landscape changes the effective accessibility of propagation from one region to another.

To express this intuition, it is useful to introduce a minimal analogy variable:

$$n_E(x)$$

where $n_E(x)$ plays the role of an effective structural refractive index. Higher values correspond to propagation that is more constrained, effectively slower, or more costly. Lower values correspond to propagation that is less constrained and more accessible.

The corresponding principle-level path rule may then be written schematically as

$$\text{path of light} = \operatorname{argmin} \int n_E(x) ds$$

This is not yet intended as the final formalism of the paper. It is the cleanest principle-level statement of why curvature becomes natural. A path bends because total structural travel cost is minimized, not because a force pushes a photon off a straight line.

The link to the rest of A-14 is straightforward. The effective structural index $n_E(x)$ is generated from the same landscape structure that also produces the slope field $g = -\nabla\Phi^E$. The difference is interpretive role: for matter the landscape appears as descent tendency; for light it appears as path preference in propagation.

10.3 Lensing and Time Delay

Once light curvature is understood as path preference in a non-uniform structural index field, two familiar gravitational-optics effects follow immediately at the principle level.

First is lensing. If the landscape contains a region where $n_E(x)$ varies strongly, multiple nearby pathways can become locally competitive in total travel cost. A single source can therefore produce multiple preferred paths to an observer, yielding multiple images and characteristic magnification patterns.

Second is time delay. When a path passes through a region of higher $n_E(x)$, its effective travel cost is larger. Two different preferred paths connecting the same endpoints can therefore accumulate different total costs and arrive at different times.

The CUWF emphasis is exact: neither lensing nor delay requires a force on light. They require only that propagation accessibility varies spatially and that light follows a preference rule consistent with that variation.

10.4 Photon Ring as a Light-Like Ring-Channel

The most dramatic case of light bending appears near black-hole boundary regimes, where standard GR predicts photon-sphere or photon-ring behavior. CUWF prepares the same phenomenon using the ring-channel vocabulary already introduced for orbit.

A photon ring is the light-like analog of a ring-shaped channel. It is a near-closed corridor of high propagation accessibility supported by the generated landscape. Near a boundary regime, gradients become extreme and pathway-closure behavior becomes sharp. This creates annular regions in which small deviations do not immediately escape, allowing repeated circulation of light-like modes.

In mountain language, the basin becomes extremely deep, the surrounding ring-channel becomes narrow and highly selective, and paths outside the channel either escape outward or are driven inward depending on accessibility. Nothing in this picture requires the language of photons

being pulled into circular motion. The ring exists because the landscape provides a structurally preferred near-closed corridor.

10.5 Why This Matters for the CUWF Program

This interpretation is important because it shows that the same generator can speak coherently across matter and light without splitting gravity into unrelated mechanisms. The same generated landscape that explains descent, orbit, and binary structure also explains lensing, delay, and ring-like light behavior.

The conceptual gain is substantial. Light bending no longer stands apart as an exotic phenomenon requiring an entirely different explanatory language. It becomes one more visible expression of non-uniform accessibility in a collapse-generated terrain.

This also strengthens the continuity of the paper. The shift from Section 8 to Section 9 and now to Section 10 is not a change of mechanism. It is the same slope-based architecture being read through different dynamical interfaces.

10.6 Core Claim of Section 10

The result of this section may therefore be stated directly. In CUWF, curved light paths are not the signature of a force acting on light. They are the macroscopic record of path preference in a non-uniform entropic or collapse landscape.

Lensing, time delay, and photon-ring behavior follow because propagation accessibility varies spatially and because light-like modes follow the most structurally compatible pathways through that variation.

10.7 Transition to Black Hole Boundary Structure

With light bending recast as path preference, the paper is now prepared to treat the most extreme regime directly: black-hole boundary structure, where steep gradients, ring-like channels, and pathway closure must all be described without abandoning the same underlying generator.