Kalascape Cosmology

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Abstract

The discovery that galaxies exhibit flat rotation curves remains one of the most important findings in astronomy. Vera Rubin first revealed this phenomenon, interpreting it as evidence for dark matter. Here it is shown that galactic dynamics can instead be fully explained by gravitational time dilation, without invoking unseen matter. From this insight emerge three interconnected phenomena: Time-Dilation Modulation (TDM), accounts for flat galactic rotation curves through asymmetric flows of time; Kalashield, a time-frozen shell at black hole horizons that distributes mass at the boundary, halts collapse, and prevents singularities. With increasing mass it progressively thins, until it transforms into filaments of the cosmic web.; and Kalaglass, A layered temporal medium that refracts and redshifts light across cosmic distances, produces the additional lensing effects usually attributed to dark matter, and explains cosmological redshift without requiring spatial expansion. Together, these effects provide a coherent reinterpretation of key cosmological observations: TDM explains stellar and galactic motions without dark matter; Kalashield describes stable black holes and their mass–energy ejections during mergers; and Kalaglass filters light from interstellar ionized plasma, generating the Cosmic Microwave Background, producing cosmological redshift without requiring space expansion, and amplifying gravitational lensing effects without additional mass. This unified framework positions gravitational time dilation as the primary driver of cosmic structure and evolution, offering elegant solutions to longstanding puzzles in astrophysics and cosmology without invoking new particles or singularities. Collectively, these mechanisms suggest that the universe is shaped not by hidden substances, but by the uneven and evolving flow of time itself. Noether's theorem states that without time symmetry there is no conservation of energy. Inside black holes, asymmetric time makes them effective engines of energy destruction.

Gravitational Time Dilation and Stellar Motion

The standard time dilation formula in a gravitational field is:

$$\Delta t = \Delta t_0 \sqrt{1 - \frac{2GM}{rC^2}}$$

Where Δt_0 is coordinate time, Δt is proper time, r is radial coordinate of the observer within the gravitational field, G is the gravitational constant, M is mass of the object creating the gravitational field, and C the speed of light.

The center of the galaxy has a massive black hole and stars are situated at distance r_1 and r_2, their masses are m_1 and m_2 with r_d distance between these stars. Gravitational force between two objects:

$$F_0 = G \frac{m_1 \cdot m_2}{r_d^2}$$

Masses m_1 and m_2 are not considerable for analysis and force F_0 will be considered later, because they are insignificant to mass M of the supermassive black hole, but they have effect on positioning of the stars.
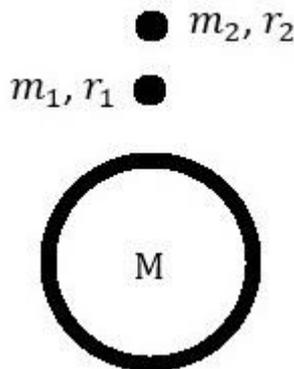
For time interval Δt_0 ($r \rightarrow \infty$) which is without effect of gravity, because of time dilation, intervals that passed on distances r_1 and r_2 are:

$$\Delta t_1 = \Delta t_0 \sqrt{1 - \frac{2GM}{r_1 C^2}} \qquad \Delta t_2 = \Delta t_0 \sqrt{1 - \frac{2GM}{r_2 C^2}}$$

Δt_1 and Δt_2 are not equal and we will use coefficient K_r which is ratio of relative dilation.

$$t_1 = K_r \Delta t_2 \qquad K_r = \frac{\Delta t_1}{\Delta t_2} \qquad K_r = \frac{\Delta t_0 \sqrt{1 - \frac{2GM}{r_1 C^2}}}{\Delta t_0 \sqrt{1 - \frac{2GM}{r_2 C^2}}}$$

Time dilation causes clocks nearer to a massive object to tick slower. Stars at different radii r_1 and r_2 experience proper time intervals Δt_1 and Δt_2, leading to the coefficient of time dilation:

$$K_r = \frac{\sqrt{1 - \dfrac{2GM}{r_1 C^2}}}{\sqrt{1 - \dfrac{2GM}{r_2 C^2}}}$$

Coefficient of relative time dilation ($K_r < 1$) shows ratio of time flow on distances r_1 and r_2 from the massive black hole. During passed time Δt_2 on distance r_2 on distance r_1 has pass time Δt_1, what can be seen directly from formula ($\Delta t_1 = K_r \Delta t_2$). Closest star is on the distance r_1 and the coefficient K_r increases at greater distances r_2 from the center. Time flows slowly as star is closer to the center, stars have less time to travel and are effectively slower than the further stars from the center of mass. For distant observer closer stars appear to move more slowly due to reduced proper time, while speed measured is unaffected in proper time.

Force F_0 is beyond influence of gravity and during time interval $\Delta t_0 (r \to \infty)$ on stars will experience proper time interval s Δt_1 (r_1) and Δt_2 (r_2).
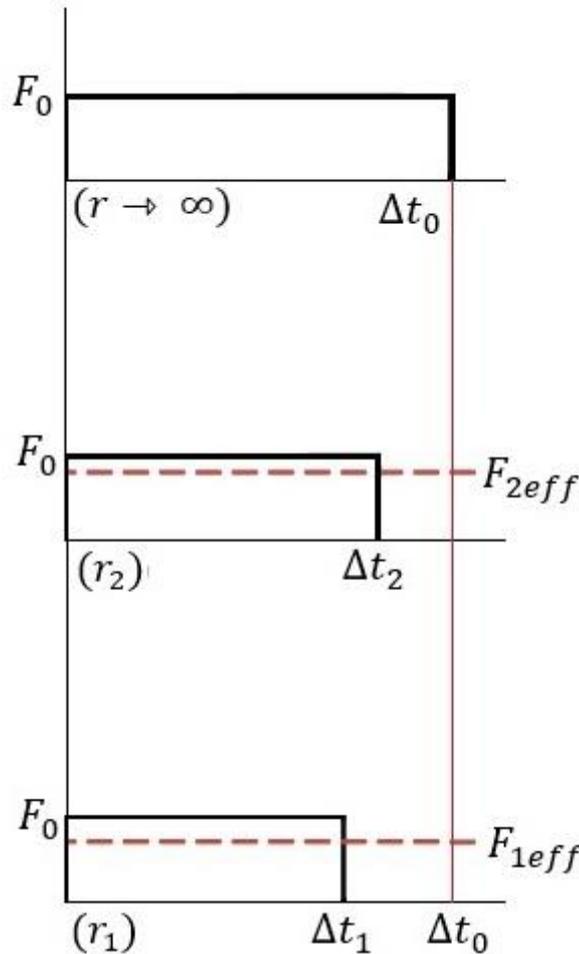
Stars experience force F_0 in shorter time intervals as they are closer to the center of the mass. Dotted line shows effective force which affects the stars. Stars experience constant force F_0 when observed from any distance. At distance without effect of gravity ($r \to \infty$) and also near the mass M at distances r_1 and r_2 will detect force F_0 constantly. Situation is different when we

consider different time flow and at distance without effect of gravity ($r \to \infty$) effective force has less intensity at distances r_1 and r_2. Distances r_1 and r_2 have different flows of time while force F_0 is constant, effective force is different because more time will pass on a further star at distance r_2.

Noether's theorem reveals that every conservation law originates from an underlying symmetry. Conservation of linear momentum, for example, arises from spatial-translation symmetry. This means that Newton's third law is not a fundamental principle in itself, but rather a consequence of momentum conservation. It is holding true only when spatial and temporal symmetries are preserved. When those symmetries are broken, Noether's framework implies that conservation laws, and with them Newton's laws, may fail. It is striking that Noether herself never explicitly applied her theorem to Newton's third law, even though the connection follows directly from her symmetry analysis.

In order to determine effective forces that apply on stars, area below dotted line during time interval Δt_0 ($r \to \infty$) needs to be equal to the area on which F_0 is applied during Δt_1 and Δt_2 when they are at distances r_1 and r_2.

$$F_{1eff}\, \Delta t_0 = F_0 \Delta t_1 = F_0 \Delta t_0 \sqrt{1 - \frac{2GM}{r_1 C^2}}$$

$$F_{2eff}\, \Delta t_0 = F_0 \Delta t_2 = F_0 \Delta t_0 \sqrt{1 - \frac{2GM}{r_2 C^2}}$$

Divided by Δt_0:

$$F_{1eff} = F_0 \sqrt{1 - \frac{2GM}{r_1 C^2}} \qquad\qquad F_{2eff} = F_0 \sqrt{1 - \frac{2GM}{r_2 C^2}}$$

This coefficient impacts effective force and velocity observed in a galaxy:

$$F_{1eff} = K_r F_{2eff} \qquad K_r = \frac{F_{1eff}}{F_{2eff}} \qquad K_r = \frac{F_0 \sqrt{1 - \frac{2GM}{r_1 C^2}}}{F_0 \sqrt{1 - \frac{2GM}{r_2 C^2}}}$$

$$K_r = \frac{\sqrt{1 - \frac{2GM}{r_1 C^2}}}{\sqrt{1 - \frac{2GM}{r_2 C^2}}}$$

Thus, inner stars, experiencing slower time than outer stars, possibly explaining flat galactic rotation curves without invoking dark matter.

Analogous to pulse-width modulation in electronics, Time-Dilation modulation (TDM) describes the effective difference in force due to differential time flow across stellar orbits.

Due to gravitational time dilation, a star closer to the galactic center experiences less proper time by a factor of K_r, while a farther star experiences more time by $1/K_r$. This causes inner stars to appear slower relative to outer stars. That means that the stars that are closer to the center of gravity have less time flow and are slower with speed reduced by factor of K_r compared to further stars. Coefficient K_r depends of distance of stars and is different for every pair within certain range. This is the way stars closer to the center of mass are slowed by reduced time flow and speed of outer stars is increased by asymmetric forces between them.

Time dilation changes effective force between two stars. Closer has less effective force to the further by factor of K_r.

$$F_{1eff} = K_r F_{2eff}$$

$$F_{1eff} < F_{2eff}$$

Effective force applied on further star is bigger by factor of $1/K_r$ ($K_r < 1$). The apparent imbalance in action and reaction forces arises due to differing time flows in gravitational fields. Star that is further away is applying force during longer time interval while force F_0 remains unchanged. If there are no other masses than (m_1, m_2, M), the star that is on greater distance (m_2, r_2) would eventually be in the same orbit as closer star (m_1, r_1). Outer stars are keeping inners away from the supermassive black hole. Outer stars are attracted by the gravity of inner stars during longer time and inner are attracted during shorter time because of dilation.
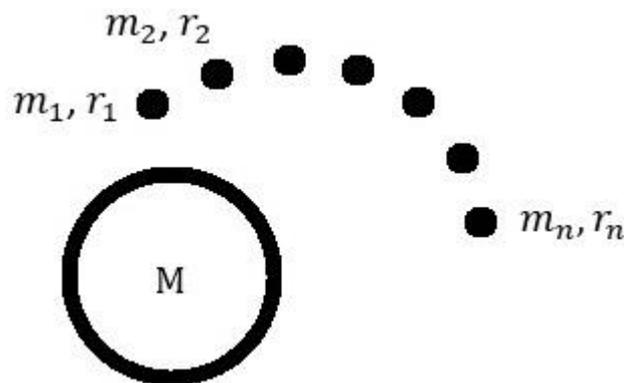
When there are more stars in the vicinity, they have influence on star (m_2, r_2) and prevent them by their gravity to get closer to the closest star (m_1, r_1). In this simplified situation looks like several stars are close enough $(m_n, r_n, n=?)$ to have significant impact. Milky Way has $(1\text{-}4) \times 10^{11}$ stars which means that thousands of stars should be considered on their effect on the star (m_2, r_2) to determine if this model is working in reality. This model can be applied also when the Galactic Bar is in the center, because it has large mass which is always present in the center of the galaxy. Stars influence each other by different forces because of different time dilation and form spirals as is the case in Milky Way. Effect of time dilation is less expressed in most distant stars in the galaxy and stars can be thrown away.

Time dilation from masses of the stars $(m_1, m_2 \ldots m_n)$ can be neglected in previous considerations, but it isn't neglectable. Effect of time dilation of two neighboring stars can affect distance of stars in the spiral and it can form spirals. Detailed analysis is complex, but it is easy to see how it influences forming of spirals. Inner stars will have less dilation, while outside stars will

have more intensive dilation. That is the way stars influence each other creating spirals in most galaxies. Not all galaxies have spiral shape, but dilation from mass of stars is affecting movement, causing outer stars to move faster.
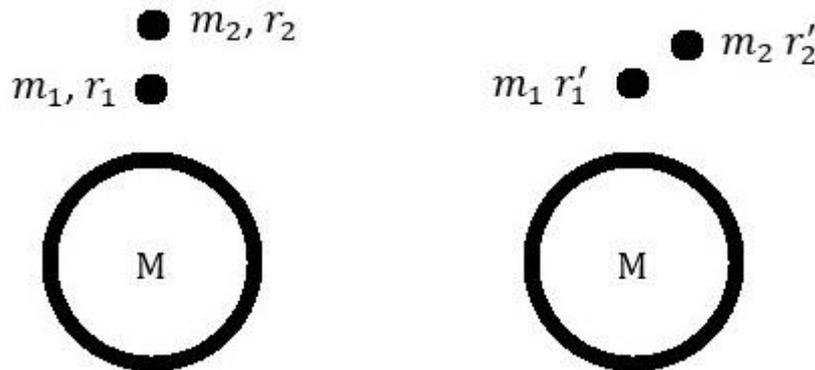
On the left side are stars that are positioned colinear with center of mass M. Mass of star m_2 has effect on star that has mass m_1, reducing the effect of time dilation that is created by mass M, which reduces time dilation on star that has mass m_1. This affects faster time flow on the star, and effectively increases the speed of the star m_1 because it has more time to travel. Star with mass m_1 will increase effect of time dilation that is created by the mass M and effectively decrease the speed of the star m_2 because it has less time to travel. Star with mass m_1 moves faster, while star with mass m_2 moves slower. In this situation star with mass m_1 will slightly move away from mass M, while star with mass m_2 will considerably move towards mass M ($r_1 > r_1'$ and $r_2 < r_2'$). After enough time both stars could be in the same orbit and collide. In the galaxies which have formed spirals there is low probability for stars to get close and collide.

TDM affects stars to have different forces of attraction between them. Time dilation affecting orbital velocities is insignificant, while TDM affects stars motion which can only be noticed with simulations of many stars orbiting. Gravitational time dilation between inner and outer stars might be small $K_r \approx 1\text{-}10^{-6}$ (for typical galactic potentials), but when applied across billions of stars, these differential time flows lead to asymmetries in effective gravitational interactions. This causes outer stars to "pull" on inner stars for longer durations from the perspective of proper time, which could amplify the net force experienced by inner stars. Dark matter may not be extra mass, but a manifestation of time-dilated interstellar dynamics. This could explain why are the stars in galaxies move faster as they are further from center. Most galaxies (60-70%) are spiral and these effects are present in all of them.

Noether's theorem shows that conservation laws, like energy and momentum, arise from fundamental symmetries such as time and space translation invariance. Time-Dilation Modulation (TDM), by creating gradients in the flow of time across space, breaks the uniformity of time translation symmetry. This implies that classical conservation laws, including Newton's third law of action and reaction, is not valid in regions affected by time asymmetry.

Kalashield: A Time-Based Black Hole Boundary

Time dilation formula can have imaginary values.

$$\Delta t = \Delta t_0 \sqrt{1 - \frac{2GM}{rC^2}}$$

In order to avoid them:

$$1 - \frac{2GM}{rC^2} > 0 \qquad \frac{2GM}{rC^2} < 1 \qquad r > \frac{2GM}{C^2} \qquad r > r_s \qquad r_s = \frac{2GM}{C^2}$$

Schwarzschild radius r_s marks the location where time dilation becomes infinite. We define the "Kalashield" as the time-frozen surface at this boundary, where mass density peaks due to halted time flow.

Black holes are considered to be mass in center which is called singularity and has radius r_s which is event horizon. We will analyze homogenous mass inside radius r_o which is outside Schwarzschild radius ($r_o > r_s$) for the mass in the volume r_o and adding more mass would turn it into a black hole because it would be slightly larger and it would achieve Schwarzschild radius because of more mass.

In order to calculate time dilation inside r_o, homogenous mass M' will be represented as the function of the volume inside radius r and density ρ.

$$M' = \frac{4}{3}\rho\pi r^3 \qquad \Delta t = \Delta t_0 \sqrt{1 - \frac{2GM'}{rC^2}} \qquad \Delta t = \Delta t_0 \sqrt{1 - \frac{2G}{rC^2}\frac{4}{3}\rho\pi r^3} = t_0 \sqrt{1 - \frac{8G\rho\pi}{3C^2}r^2}$$

$$M = \frac{4}{3}\rho\pi r_s^3 \quad \rho = \frac{3M}{4\pi r_s^3} \quad \Delta t = \Delta t_0 \sqrt{1 - \frac{8G\rho\pi}{3C^2}r^2} = \Delta t_0 \sqrt{1 - \frac{2GM}{r_s^3 C^2}r^2} = \Delta t_0 \sqrt{1 - \frac{r^2}{r_s^2}}$$

Time dilation equations can be simplified for further analysis $r_s = 1$.

$$\Delta t = \Delta t_0 \sqrt{1 - \frac{1}{r}} \qquad \Delta t = \Delta t_0 \sqrt{1 - r^2}$$

$$\frac{\Delta t}{\Delta t_0} = \sqrt{1 - \frac{1}{r}} \qquad \frac{\Delta t}{\Delta t_0} = \sqrt{1 - r^2}$$

Last equations are $К_r$ where ($r_2 \rightarrow \infty$). It is appropriate approximation for dilation inside and outside object. In the center there is no gravity effect on dilation because of superposition of the surrounding mass. On x axis $r_s = 1$ and on y axis is $К_r = 1$ at distance ($r_2 \rightarrow \infty$).
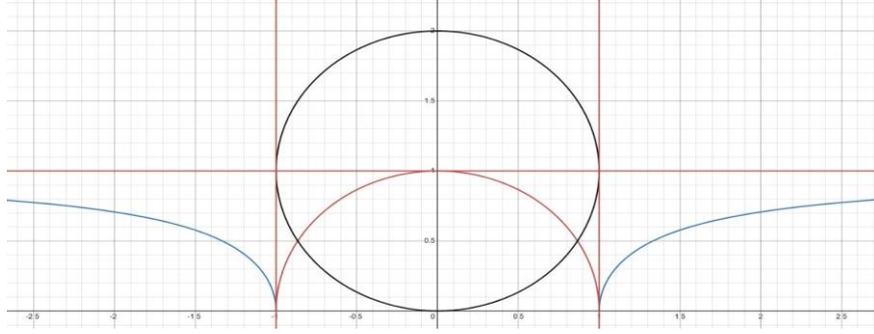
Time dilation through object $(y = 1)$ with the center in (0,1) and radius r_s=1. In the center is maximal coefficient $К_r$ which in ideal situation is not under influence of gravity. Time effectively stops on the surface of a black hole, while in the center it flows with without dilation and there is no singularity with indefinite density. From a distant reference frame, proper time near the horizon asymptotically approaches zero flow.

The radius of a homogeneous mass is slightly larger than its Schwarzschild radius, and adding more mass would turn it into a black hole. It is usually presumed that such an object collapses into a singularity of infinite density, but at the Schwarzschild radius the flow of time slows to an extreme, creating a surface that resists further collapse. That surface contains mass, does not move in external time, and its gravity concentrates density at the Schwarzschild boundary. The Kalashield is this surface of a black hole where the flow of time nearly halts and matter reaches its greatest density. *Schwarzschild* itself means "black shield" while the Sanskrit word *kāla* means "time", "black" or "death". Kalashield is thus the black shield of matter which brings the death of time on the surface of a black hole, halting collapse before a singularity can form.

In the homogeneous interior model, time dilation gradients are smooth, and energy loss is modest. In the Kalashield configuration, however, the entire gradient collapses onto the surface, creating a discontinuity where time symmetry is maximally broken. By Noether's theorem, this symmetry breaking implies the most efficient destruction of energy and entropy reduction inside the black hole.

As additional mass falls in, the Kalashield expands outward, increasing its radius rather than compressing toward the center. Whereas stars require internal pressure and energy to resist collapse, black holes rely on time dilation itself to halt the collapse, without any supporting pressure. As a result, the densest region is located at the Kalashield surface, while the interior becomes progressively less dense. In the case of supermassive black holes, the internal volume is almost completely empty and almost all mass is on thin shell of the Kalashield.

If black holes are approximated with homogenous mass inside volume of a sphere with radius equal to its Schwarzschild radius, their density would decrease with more mass.

$$r_s = \frac{2GM}{C^2} \quad V = \frac{4}{3}\pi r_s^3 = \frac{4}{3}\pi \left(\frac{2GM}{C^2}\right)^3$$

$$\rho = \frac{M}{V} = \frac{M}{\frac{4}{3}\pi \left(\frac{2GM}{C^2}\right)^3} = \frac{3C^6}{32\pi G^3 M^2}$$
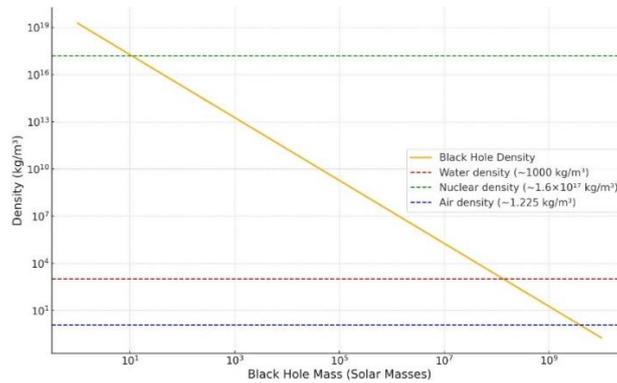
Black hole density scales inversely with mass. Neutron stars have the highest densities, while stellar black holes are somewhat less dense. Adding more mass to a black hole actually decreases its average density. Supermassive black holes become progressively more diffuse, eventually reaching average densities lower than water, or even air. At the extreme, a black hole above 10^9 M☉ would have an average density approaching zero. By comparison, the density of matter in the most massive cosmic filaments is roughly a single particle per cubic meter.

The Abell 222–223 filament has an average mass density of only $(4.6–6.9) \times 10^{-26}$ kg m^{-3}, which corresponds to roughly 30–40 particles per cubic meter, which is thinner than a laboratory vacuum, with total mass $(6.5–9.8) \times 10^{13}$ M☉. Cosmological simulations (IllustrisTNG, Millennium, etc.) predict filament masses in the range 10^9–10^{11} M☉. Cosmic filaments can exceed the mass of known black holes while maintaining lower average densities due to their extended structure.

On cosmic scales, large-scale filaments have densities that are millions of times lower than any familiar material, illustrating the extreme emptiness of the cosmic web. If the mass of such a filament were redistributed into a spherical shell, as in the case of a black hole, the layer would be so thin and fragile that it would naturally fragment back into filamentary structures. Under such conditions, a Kalashield would be inherently unstable and would collapse into the observed cosmic web, with its network of filaments and nodes.

When a supermassive black hole exceeds about 10^9 M☉, adding more mass thins its Kalashield to the point of structural failure. This breakdown could transform the black hole into elongated cosmic filaments, structures often mistaken for manifestations of dark matter. In reality, these filaments are ordinary matter torn from a ruptured Kalashield and redistributed across vast scales. Such immense black holes cannot distribute additional mass evenly along the Kalashield, because the imbalance distorts the boundary until it rips apart. The result is a network of filaments with vast empty regions between them.

Kalascape explains cosmic filaments without invoking dark matter. These filaments are composed entirely of ordinary matter, arranged in long, thin structures that always maintain high local densities. Because of these high densities, the filaments appear to contain only mass, which is why their gravitational effects are traditionally attributed to dark matter. Nevertheless, the average density of a filament remains far below that of an ultra–high-vacuum laboratory environment. In addition, Plasma cosmology shows that large-scale filaments are maintained and stabilised by electromagnetic effects, with magnetic fields guiding the motion of charged particles and supporting the overall structure.

Gravitational Refraction

Gravitational lensing is one of the most direct and observable predictions of general relativity. However, for decades, discrepancies between the observed strength of lensing and the visible distribution of matter have led to the postulate of an invisible "dark matter", inferred only through its gravitational mass. In the Kalaglass view, mass not only curves space but also generates gradients in the flow of time. These time dilation gradients act as a refractive medium for light, adding an additional contribution to the lensing effect beyond that predicted from spatial curvature alone.

Galaxy clusters such as Abell 1689, El Gordo, and the Bullet Cluster produce lensing deflections far exceeding what visible matter alone can explain. Standard models solve this discrepancy by postulating vast halos of unseen matter, distributed in precisely the ways needed to match the data. But light may not simply be following geodesics in curved spacetime: instead, it may be traversing a time-dilation optical medium shaped by gradients of time dilation.

Kalaglass is a refractive medium where gravitational dilation slows time, forming gradients of temporal density. Just as light bends when passing through glass with a varying refractive index, photons bend inward toward regions of slower time flow.

- Time dilation = increased optical density

- Light refracts inward, not only geometrically curved

- The region acts not like a mirror or lens in space — but like a vortex in time

Kalaglass is therefore a layered temporal medium in which variations in the flow of time act as refractive structures for photons. While gravity curves space, uneven time flow additionally refracts light, producing enhanced gravitational lensing. Unlike conventional treatments, which attribute lensing solely to invisible mass, Kalaglass explains strong arcs, weak distortions, and cluster-scale shear through time-induced optical refraction.

This effect scales with mass but is especially striking in dwarf galaxies, which appear to contain more matter than they actually do. Both rotation curve anomalies and lensing discrepancies can thus be reinterpreted as optical consequences of layered time, eliminating the need for dark matter.

Kalaglass also reframes other key cosmological observations:

- **Supernova dimming:** As photons traverse temporal gradients, their paths lengthen and disperse, creating an effective "cosmic opacity". Distant Type Ia supernovae appear fainter without requiring accelerated expansion or dark energy.

- **Quasar brightness:** Cumulative time-flow gradients reduce observed intensity and alter photon trajectories, mimicking intrinsic variability.

- **Cosmological redshift:** Photons traveling from slower to faster regions of time are consistently redshifted. This produces the observed Hubble relation as a unidirectional consequence of gravitational time dilation — no universal expansion is required.

In Kalascape cosmology, distortions of time and distortions of space are treated as distinct phenomena. Gravitation produces both a curvature of space and a modulation of time. The general relativity unifies these into a single spacetime distortion, Kalascape separates them into independent contributions.

Kalaglass is one of the central components of this framework. Alongside Kalashield and Time Dilation Modulation (TDM), it arises from the distortion of time produced by mass. Spatial distortions due to gravity are well established within general relativity. The Kalascape emphasizes that temporal distortions by gravitational time dilation are often overlooked in cosmological modeling. In this view, distortions of time are treated separately from distortions of space, and mass is considered separately from energy.

From the standpoint of general relativity, time dilation is a manifestation of curvature rather than a physical medium. Kalaglass reinterprets it refractively. The local speed of light remains invariant, but the apparent "slowing" of photons arises as an effective description of their passage through temporal gradients. As photons traverse these gradients, their trajectories bend additionally due to variations in time flow, analogous to refraction in a medium with a spatially varying refractive index. This produces enhanced gravitational lensing, offering a natural explanation for strong lensing arcs, weak lensing distortions, and cluster-scale shear without invoking additional, unseen mass.

The effect naturally scales with mass, being strongest in larger systems, but it is observed most clearly in smaller galaxies, such as dwarfs, where time-layered refraction makes them appear as if they contain considerably more mass than they actually do. In these cases, anomalies in lensing and rotation curves can be reinterpreted as optical consequences of layered time, with no need for any unseen mass previously attributed to dark matter.

Type Ia supernova dimming, usually attributed to dark energy, also follows naturally from Kalaglass. As light traverses temporal gradients, its path lengthens and disperses, creating an effective 'cosmic opacity' that makes distant supernovae appear dimmer, without accelerated expansion.

Similarly, the brightness of quasars and other luminous objects at cosmological distances can be affected by the layered temporal medium: cumulative time-flow gradients reduce the observed intensity and modify the light travel path, producing apparent luminosity variations that are otherwise interpreted as intrinsic or expansion-related effects.

Kalaglass fully explains cosmological redshift, eliminating the need for space expansion or dark energy. Photons moving from regions of slower time to faster time are consistently redshifted, with no possibility of blueshift on cosmic scales. This results directly from the cumulative gravitational time dilation within layered temporal structures.

Black Hole Entropy

If something with entropy falls into a black hole and vanishes, it would seem like entropy is destroyed. To resolve this, Bekenstein argued: "Black holes themselves must carry entropy proportional to their surface area." Idea was later supported by Stephen Hawking, who showed that black holes emit Hawking radiation, indicating they have temperature and emissivity like a black body. Despite their faintness, this radiation proves that black holes are thermodynamic systems, with temperature, entropy, and energy. Information is not lost.

$$T_H = \frac{\hbar C^3}{8\pi GM k_B}$$

The Hawking temperature T_H is defined at the event horizon. Standard theory assumes incoming energy instantly converts to mass, slightly lowering temperature T_H, but no mechanism for this has been observed. The interior has no measurable temperature, and intermediate heating is ignored.

In traditional models, entropy accumulates at a mathematical boundary without a clear physical structure. Kalashield replaces that abstraction with a real, time-frozen shell. The Planck length ℓ_P Planck time t_P represent the smallest meaningful units of space and time — the quantum "pixels" of reality. Black hole entropy is proportional to area in Planck units:

$$\ell_P = \sqrt{\frac{G\hbar}{C^3}} \qquad t_P = \frac{\ell_P}{C} \qquad S_{BH} = \frac{k_B C^3 A}{4G\hbar} = \frac{k_B A}{4\ell_P}$$

Bekenstein–Hawking entropy is projected on the black hole's surface, reflects what can be externally measured, but the true number of microstates inside may be far greater.

$$S = S_{BH} + S_{ks}(T_{ks}) + S_i(T_i) + S_e(T_e)$$

The total entropy is the sum of Bekenstein–Hawking entropy S_{BH}, entropy of the Kalashield $S_{ks}(T_{ks})$, interior entropy $S_i(T_i)$, and exterior entropy $S_e(T_e)$. All entropies except Bekenstein–Hawking entropy S_{BH} depend on the temperature inside and outside black hole. At absolute zero temperature, the entropy of a black hole would be equal to S_{BH}, but minimal temperature of a black hole is temperature of the Hawking radiation. Without external mass around black hole minimal possible entropy is with temperature of Hawking radiation T_H.

$$S = S_{BH} + S_{ks}(T_H) + S_i(T_H)$$

Increasing total mass of a black hole will always decrease interior mass as it is transferred to Kalashield, reducing entropy $\Delta S_i \leq 0$ and increasing entropy S_{ks}, while ejection of mass increases interior and exterior entropies (ΔS_i and ΔS_e), while Kalashield entropy decreases $\Delta S_{ks} \leq 0$.

When no mass falls in and no energy is ejected, a black hole's entropy steadily decreases. Strong gradients of time dilation inside break time symmetry, causing every particle and photon to lose energy as it moves inward. This annihilates interior entropy while also reducing the temperature and entropy stored on the Kalashield surface. Since conservation laws, including the second law of thermodynamics, require time symmetry, within black holes entropy is not conserved but both annihilated and redistributed.

$$\frac{dS_{ks}}{dt} \le 0 \qquad \frac{dS_i}{dt} \le 0 \qquad \frac{dS}{dt} = \frac{dS_{ks}}{dt} + \frac{dS_i}{dt} \le 0$$

Even in standard black-hole descriptions with singularities, matter falling toward the horizon appears, to an external observer, to slow and asymptotically "freeze" near the event boundary. Observationally relevant quantities — the gravitational field, emitted radiation, and lensing signatures — therefore originate from this near-horizon region rather than from a causally inaccessible interior. This external appearance implies effective accumulation of mass and information at the boundary, and continued accumulation naturally produces a growing, massive shell — the Kalashield. For smaller (stellar-mass) black holes, the interior carries significant hidden microstates, but as mass and energy accumulate toward the boundary, the relative distribution shifts outward and the interior entropy and mass decrease. Regardless of the assumed interior model, the physically operative layer for observations is the shell at the boundary – the Kalashield.

$$r_s = \frac{2GM}{C^2} \quad \rho A = \frac{M}{4\pi r_s^2} = \frac{C^4}{4\pi G^2 M}$$

Surface density ρA depends on mass M. Supermassive black holes have almost all mass in a shell at radius r_s as direct consequence of entropy. With more mass and radius, the surface density ρA decreases. Kalashield with less surface density gets thinner, but volumetric density remains constant which is also consequence of entropy. Eventually when it gets thinned to a certain point, as $\rho A \approx 1 kg/m^2$ it forms filaments, which is calculated from observed filaments with minimal mass. That is the surface density of a filament observed to have least mass, and more massive filaments will have less surface density.

Kalashield exhibits an almost constant volumetric density, a direct consequence of its entropy. When sufficient mass accumulates, the surface density decreases until reach the maximum values observed in cosmic filaments $\rho A \approx 1 kg/m^2$. Even as Kalashield evolves into filamentary structures, its volumetric density remains largely preserved. Gravitational forces and time dilation jointly act to sustain this near-constant density throughout the transformation.

When the Kalashield "tears" and transforms into cosmic filaments, the total entropy cannot decrease due to the second law of thermodynamics. Consequently, the volumetric density remains nearly constant, stabilized by gravity and time dilation effects, even as the structure changes shape. This explains why filaments, though appearing distinct, consist of dense normal matter under extreme gravitational conditions and are often mistaken for dark matter. Because of their extreme density and thinness, filaments primarily reveal their mass through gravitational effects rather than direct observation. Their density remains extremely low, which is often less than one particle per cubic meter, underscoring their vast emptiness.

Hawking's area law reflects that the event horizon hosts the maximum entropy density of a black hole. In the Kalashield model, almost all the mass, entropy, and information are stored on a time-frozen shell at the event horizon. This shell acts as a boundary where extreme gravitational time dilation halts collapse, preventing singularity formation. In supermassive black holes, nearly all the mass and entropy reside in the Kalashield shell. By concentrating the black hole's degrees of freedom on this surface, Kalashield naturally aligns with Hawking's insight that black hole entropy scales with horizon area. Crucially, this means no information is lost inside the black hole, but preserved on the Kalashield shell, resolving the black hole information paradox and preserving unitarity in quantum mechanics.

Hawking's framework assigns black holes an extremely low temperature determined solely by their mass, rendering them effectively thermally inert in most astrophysical contexts. From a thermodynamic perspective, however, this is problematic because any physical system with energy must possess a finite temperature. The emission of vanishingly weak Hawking radiation does not imply that the interior temperature of a black hole is zero. Rather, Hawking radiation represents only the minimal radiation and the corresponding minimal temperature of a black hole. Any infalling mass or energy raises the temperature of the shell, increasing both entropy and radiation above the Hawking baseline. In reality, the interior temperature of a black hole must exceed the Hawking value, as gravity creates extreme time dilation and prevents energy from escaping efficiently, but black holes lose temperature from inside as a consequence of time asymmetries.

In the Kalashield model, the surface is not smooth or static but instead shaped by temperature gradients and dynamic activity. These gradients become especially pronounced in the presence of an accretion disk, as in quasars, where uneven heating of the Kalashield surface can trigger localized eruptions of mass and energy. These outbursts are driven by rapid surface instabilities rather than processes limited by the light-crossing time of the entire object and naturally explain the quasar variability paradox. Brightness can change on timescales shorter than the diameter of a black hole would allow. In this way, the Kalashield provides a straightforward resolution without invoking exotic physics or superluminal mechanisms.

Black holes gradually cool over cosmic timescales, mostly from interior time asymmetries and less from exterior emissions of energy. When sufficiently cold and massive, their Kalashield shell become thin and eventually rupture, transforming into the filaments of the cosmic web. Both the filaments and the dense nodes of the cosmic web are expected to maintain temperatures comparable to the surrounding medium, rendering them effectively invisible due to their small angular size in observations.

If an infinite-density state had existed before the Big Bang, it would have carried extreme entropy and required an enormous energy release, far exceeding that of any supernova. Such conditions should have driven heavy nucleosynthesis, producing vast amounts of iron and heavier elements. Yet observations show the early universe was overwhelmingly metal-poor, composed almost entirely of hydrogen and helium. The standard model simply assumes, without addressing the energy budget or nucleosynthetic consequences, that this primordial composition arose from an initial singularity. The observed elemental distribution strongly argues against a Big Bang singularity of infinite density, which is precisely the kind of unphysical collapse avoided by the Kalashield.

Kalascape of a Black Hole

In conventional relativity, black holes are treated as regions of extreme spacetime curvature with an event horizon and a central singularity, obeying Hawking's four laws. However, this framework cannot explain the interior structure of the horizon or the role of time asymmetries.

Hawking black holes are associated with several fundamental paradoxes. The information loss paradox arises because Hawking radiation is thermal and seemingly carries no information about infalling matter, violating quantum unitarity. The singularity paradox stems from the central point of infinite density, where classical physics breaks down. The entropy paradox emerges as black hole entropy is attributed solely to the horizon, ignoring the interior and leading to apparent limitless growth of entropy. The firewall paradox challenges the equivalence principle, suggesting that infalling observers encounter high-energy radiation at the horizon, while the evaporation paradox highlights the instability caused by negative heat capacity.

Kalascape cosmology resolves these issues. Black holes are not singular objects but hollow structures enclosed by a Kalashield, with their interiors filled by Kalaglass — a layered temporal medium. This configuration produces intrinsic time asymmetries. By Noether's theorem, energy conservation is tied to time symmetry. When time invariance is broken, energy is not conserved. Within black holes, energy is continuously dissipated or destroyed by the asymmetric flow of time.

In the Kalascape framework, mass or energy entering a black hole is drawn toward the Kalashield. Instead of dispersing throughout the interior, infalling matter accumulates mainly on this shell, effectively reducing interior entropy. The Kalashield itself both stores and radiates energy, inward as well as outward, further lowering the total entropy of the system. Unlike Hawking's model, which considers only constant horizon entropy, Kalascape explicitly distinguishes between interior and boundary entropy, leading to the prediction of entropy reduction.

The Kalaglass mechanism explains how photons are refracted by temporal gradients, producing effects normally attributed to dark matter and dark energy: gravitational lensing, supernova dimming, and cosmological redshift. The Kalashield stabilizes black holes without requiring singularities, while time asymmetries inside the interior drive energy destruction and a net negative entropy change.

In the absence of significant infall, black holes gradually cool from both the interior and exterior. They are therefore not eternal reservoirs of energy but dynamic, cooling, time-structured systems. For matter, however, they remain almost inescapable traps.

In contrast to Hawking black holes — treated as entropy factories with singular interiors and ever-growing horizons — Kalascape black holes redistribute entropy: they consume and cool the interior while increasing entropy at the boundary and through radiation or surface ejections. This framework naturally resolves singularity and information paradoxes, preserves thermodynamic consistency, and explains rapid quasar variability, as Kalashield instabilities produce bursts of energy faster than the light-crossing time of the black hole, something a static Hawking horizon cannot account for.
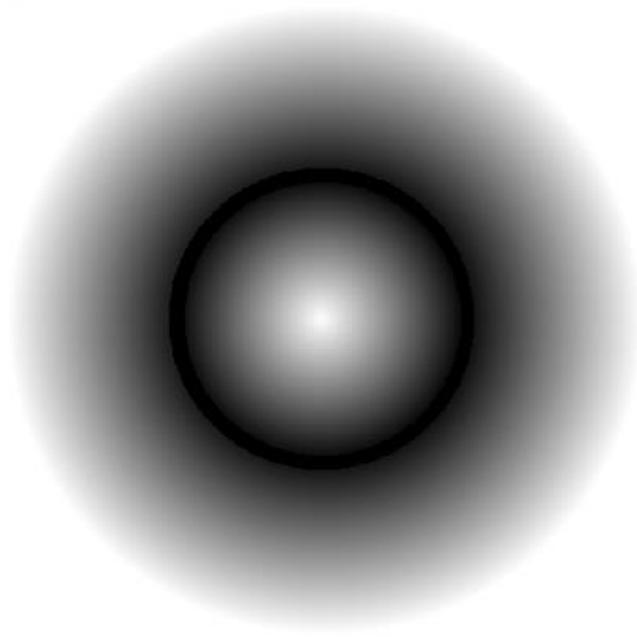
Visualization of time gradients within and around a black hole. Darker shading marks regions of stronger time dilation. Mass accumulates along the Kalashield shell, which defines the true boundary of the system. General Relativity unifies space and time as a single continuum, while Kalascape cosmology treats them as distinct. Time it is both creator and destroyer and is not merely a passive measure of motion and energy. The flow of time within the black hole consumes and erases energy. This phenomenon, the Kalaglass effect, may be described as the death of energy by time. The name unites the Sanskrit word "kāla" (time) with the word "glass", reflecting the way the universe behaves like a refractive medium.
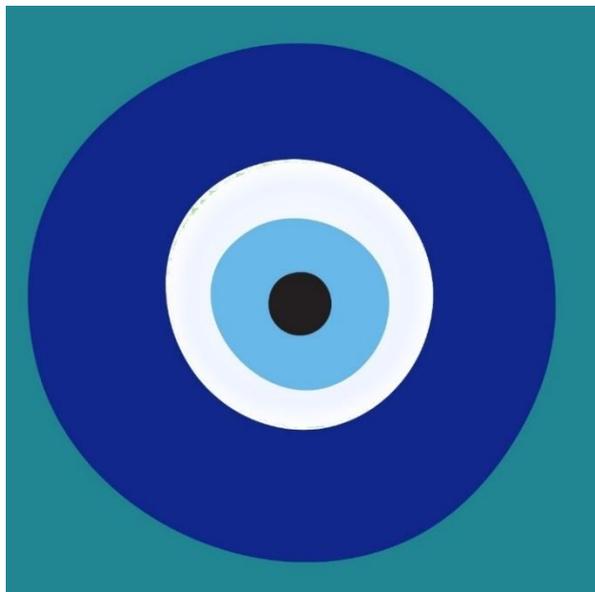
The "Turkish eye" also known as *nazar* in Turkish or the "evil eye" is a blue-and-white amulet believed to protect against misfortune, a concept shared across many cultures. Widely used in Turkey and Greece, it is often worn as a pendant or displayed in homes, where its gaze is thought to reflect negativity back to its source. I keep one hanging on my wall, along with a horseshoe above the front door. It is said that such charms work whether or not one believes in them.

A black hole collision

Gravitational waves are emitted as two black holes spiral toward each other, with the strongest wave produced when they merge and the largest amount of mass is lost. Without this emission, the black holes would take far longer, possibly an infinite time to merge, as gravitational waves are the main mechanism for energy loss. The total energy carried away equals the system's mass loss, since mass and energy are treated as equivalent in general relativity, but they should be considered separately . Gravitational waves reduce the system's mass, but general relativity does not explain what happens to the mass, but only considers that it leaves the system. As black holes approach each other, their shape is distorted from tidal interactions which occur when the gravitational pull of one massive object distorts the shape and affects the internal structure of its companion. Kalashields get distorted slightly, but aren't distorted significantly as centrifugal force ejects mass from preventing further distortions. Black holes are ejecting mass as long as they produce gravitational waves.

During the ringdown phase, a newly formed black hole is highly distorted and rapidly settles by emitting gravitational waves. That is an outcome difficult to reconcile with the existence of true singularities. Light detected days or even years after mergers may not originate externally. Instead, it could emerge from the black hole's own structure. Outflows have been observed moving at up to 50% the speed of light, releasing excess energy and previously absorbed matter.

A potential post-merger signal was observed following the binary black hole merger on May 21, 2019 (GW190521), involving black holes of ≈85 and ≈66 solar masses, forming a final black hole of ≈142 solar masses. An optical flare was detected 34 days later by the Zwicky Transient Facility, coinciding with the event's location.

A striking example occurred in October 2018, when astronomers observed a star being torn apart by a supermassive black hole about 665 million light-years away. Nearly three years later, in June 2021, a sudden outflow of material was detected, moving at relativistic speeds. Astronomers suggested the black hole may have "burped" out the star's remnants long after the initial disruption. The star was absorbed, its mass settled inside the Kalashield where fusion occurred, and once the system became energetically overfilled, the excess mass and energy were ejected.

In the Kalashield framework, such delayed, high-speed outflows are expected. The black hole's time-frozen shell stores mass, angular momentum, and internal energy. Magnetic fields and internal pressure can gradually destabilize the shell, triggering sudden ejections once an energy threshold is exceeded. Black holes continuously absorb photons and particles, raising internal energy without necessarily converting all of it into mass. While general relativity equates mass and energy, it does not require one to automatically transform into the other. In all physical systems, energy-to-mass and mass-to-energy conversion occur only under specific conditions. Black holes are no exception. There is no mechanism forcing all absorbed energy to become mass. Instead, excess energy can remain stored within the Kalashield until it is explosively released, much like the mechanisms driving quasars and pulsars.

Quasars and Pulsars

In Plasma Cosmology, quasars, black holes and pulsars are magnetized plasma filaments. Pulsars are not ultra-dense neutron stars and their observed pulses arise from Alfvén waves and magnetohydrodynamic (MHD) oscillations propagating along the plasma column. The pulse timing is determined by the wave's travel distance and the local plasma environment, with wave velocities reaching up to ~10% of the speed of light. Variations in plasma density or current naturally produce irregularities in pulse timing. Periods of "nulling" (signal dropout) occur when instabilities or current shifts redirect waves inward, away from the regions that radiate. Instead of a rigid crust, pulsars in this model feature a dynamic plasma layer that oscillates and modulates the emission. Rotation still plays a role in driving or shaping these oscillations, but the observed periodicity is not simply locked to spin, as assumed in the standard neutron-star model. Within the Kalascape framework, massive objects retain most of their bulk mass in condensed matter, while plasma forms an internal component. Emissions arise from deformations at the plasma–matter boundary, most often expressed as periodic oscillations of the surface.

In Kalascape cosmology, every massive object hosts an internal magnetic field. Quasars, pulsars, and black holes are treated as bodies with both mass and a surface, but they also sustain magnetized plasma structures. Pulsars, having lower density than stellar-mass black holes, allow their plasma structures to radiate signals outward because their surfaces are too thin to fully confine the magnetic field. Supermassive black holes, though enormously massive, have much lower average densities, which creates similar conditions for large-scale plasma-driven emission, as observed in quasars. In contrast, stellar black holes reach the highest densities, confining their plasma structures deep within and rendering them nearly undetectable from the outside.

Neutron stars have their surfaces disturbed primarily by magnetic waves originating in their interiors. These disturbances generate surface oscillations in a variety of patterns. They may remain synchronous and highly periodic, as in millisecond pulsars, sometimes interrupted by irregularities in pulse timing. Other pulsars display more complex emission patterns, occasionally switching between prolonged "ON" and "OFF" states. In all cases, magnetic waves imprint surface dynamics that underlie the diversity of pulsar behavior.

Black holes also experience surface disturbances driven by magnetic waves. In stellar-mass black holes, however, the extreme density of the Kalashield confines these oscillations so deeply that little or no signal escapes, rendering them nearly undetectable. Supermassive black holes, by contrast, have much lower average densities and correspondingly thinner Kalashield surfaces, allowing more signals to emerge.

Quasars represent the most dynamic case. Their Kalashield surfaces are continually disturbed by accretion disks, which act like storms of radiation and infalling matter, agitating the boundary much as wind ruffles water. Because of their vast scale, quasars develop large surface deformations, with signals emitted across the entire Kalashield rather than from localized regions. Without accretion disks, quasars would remain comparatively quiet, producing only smaller-scale ejections.

As quasar light travels for billions of light-years, it passes through Kalaglass which bends, filters, and aligns light by passing only certain polarization angles, turning chaotic beams into collimated, polarized, and phase-stable streams. This time-geometry filtration produces Q-LAK (Quasar Light Aligned by Kalaglass). Their signals are sculpted by gravitational time gradients.

Observational Evidence:

- **Large-Scale Quasar Polarization Alignments**
  Hutsemékers et al. (2005–2021) found quasars billions of light-years apart with aligned polarization — statistically impossible in ΛCDM, which has no mechanism for such coherence. Kalaglass explains it: over vast distances, only photons within the "passband" of layered time dilation survive, naturally preserving aligned polarizations.

- **Blazar Jets**
  Blazars emit stable, highly polarized, laser-like beams that plasma physics alone cannot maintain over gigayears. Kalaglass layers filter and collimate the jets, stripping incoherence and preserving polarization across cosmic distances.

- **Brightness Anomalies**
  Some quasars appear far too bright or dim for their redshift, defying ΛCDM without ad hoc lensing or absorption. In Kalaglass theory, time-dilation gradients act as cosmic collimators — enhancing beams along certain sightlines, scattering them along others.

- **Coherent Radio Emission**
  Radio coherence from distant quasars should be erased by scattering, yet it persists. Kalaglass filtration removes unstable modes early, allowing only phase-stable signals to propagate.

- **Quasar Variability Paradox**
  The Kalashield surface is storm-tossed rather than uniform, with localized regions releasing bursts of energy at different times. This patchy, wave-driven emission allows quasars to vary far faster than classical light-crossing limits permit — a paradox in the standard model, where such rapid changes should be impossible for objects of this size.

In Kalascape model more redshift does not mean slower variation, as quasar shell is producing variations and more redshift means more filtering, yet fast-changing signals still pass. In Plasma Cosmology, the magnetized plasma structure itself provides the structural integrity of both black holes and quasars. Instead of relying on a spacetime singularity or event horizon, these systems are stabilized by electric currents and magnetic confinement, forming stable plasma pinches that maintain their structure. Kalashield fulfills this role in Kalascape Cosmology. Shell is compressed by time dilation, contains most of the mass, the magnetic field, and ensures the object's structural integrity. In quasars, the magnetic field becomes more active and dynamic by the surrounding accretion disk, which enhances field activity and drives continuous mass ejection.

Cosmic Microwave Background

Timescape cosmology offers an innovative explanation for cosmic acceleration by attributing it to gravitational time dilation differences between voids and galaxy walls, removing the need for dark energy. It focuses on how observers' clocks run differently in various cosmic environments, assuming standard light propagation and accepting the Cosmic Microwave Background (CMB) as a relic from the early universe. However, Timescape is incomplete, as it cannot explain the additional gravitational mass inferred from galaxy rotation curves and gravitational lensing, phenomena traditionally attributed to dark matter. Its framework, centered solely on observer clock differences, provides no mechanism for the extra gravitational influence on stars and photons.

Kalascape incorporates Timescape's insight about clock-rate differences but extends it fundamentally by introducing time-flow gradients as a refractive medium affecting photon trajectories and frequencies. This novel effect explains both the apparent cosmic acceleration and the gravitational effects traditionally attributed to dark matter, without invoking unknown substances.

Plasma Cosmology proposes that much of the CMB originates from thermal emission of intergalactic plasma. In combination with Kalascape, this plasma supplies the source of the radiation, while Kalaglass ensures isotropy and spectral uniformity, addressing a key weakness of Plasma Cosmology and removing the need to interpret the CMB as a relic of the Big Bang. Intergalactic plasma and large electric currents generate magnetic structures such as filaments, jets, and cluster nodes. These regions have different gravitational potentials, leading to varying local time rates. As radiation passes through these layered time-dilation zones, the geometry of time itself acts as a refractive medium, progressively filtering and organizing photons. The classical Big Bang singularity and its initial state of infinite density contradict the fundamental behavior of mass-density scaling in the universe, making such conditions impossible according to physical laws.

Kalascape cosmology is similar to Timescape cosmology combined with parts of Plasma cosmology to explain CMB, quasars, pulsars and black holes by magnetized plasma structures.

In the Kalascape framework, the CMB is not direct emission from a primordial surface but a diffuse background of light from all sources. Intergalactic plasma emits the bulk of this radiation, while Kalaglass layers filter, smooth, and align the photons during propagation. Higher-energy photons are redshifted and refracted when passing through gravitational time-dilation shells surrounding massive structures, producing a uniform, featureless Planck-like spectrum across the sky. Gravitational redshift from evolving potentials produces only tiny anisotropies (≈ 10 μK). In contrast, the Kalaglass redshift, originating from bent time, reshapes the diffuse background spectrum itself. This ensures the CMB appears homogeneous and blackbody in all directions, while direct light from stars, galaxies, and gas retains its spectral features. Just as frosted glass shows the same color regardless of underlying details, Kalaglass guarantees spectral uniformity, leaving only the question of why its temperature is precisely 2.725 K.

Newton's Laws under Noether's Theorem

Noether showed that conservation laws exist only when symmetries exist. If a symmetry is absent, the corresponding conservation cannot be guaranteed.

Newton's first law:" *Every object perseveres in its state of rest, or of uniform motion in a right line, unless it is compelled to change that state by forces impressed thereon.*"

The first law presumes a uniform, homogeneous flow of time. Only then can we say that a body "continues in its state of rest or uniform motion unless acted upon by a force."
But if time itself is not symmetric—if clocks tick differently depending on position—then "uniform motion" is no longer globally meaningful. The first law holds only where time symmetry is preserved.

Newton's second law:" The *change of motion of an object is proportional to the force impressed; and is made in the direction of the straight line in which the force is impressed.*"

The second law survives, but in a modified form. In relativity, force must be defined with respect to proper time, which is the time experienced along the object's own path. In relativity, force law must be written using proper time.

$$F^\mu = \frac{dP^\mu}{d\tau}$$

where $d\tau$ is proper time. Newton's second law remains valid when expressed in terms of proper time. However, when written in coordinate time, the apparent acceleration decreases in proportion to the local time-dilation factor, and its value is further modified when compared to accelerations measured in another proper-time frame.

Newton's third law:" *To every action, there is always opposed an equal reaction; or, the mutual actions of two bodies upon each other are always equal, and directed to contrary parts.*"

The third law rests on global conservation of momentum: every action must be balanced by an equal and opposite reaction. Noether tells us this conservation exists only if the underlying symmetries exist. When time symmetry is broken, energy conservation can fail and when energy fails, momentum balance also fails.

The connections between Newton's laws, symmetries, and Noether's theorem are known separately within advanced physics. The first and third laws collapse without global time symmetry, while the second law survives only in the language of proper time. However, they are rarely presented together in one place, and almost never in a way that highlights how each Newtonian law depends on time symmetry. Unequal forces between stars appear to be "violations" of Newton's laws, but are natural outcomes of broken symmetry. The same principle underlies cosmic redshift, the gradual cooling of black holes and also filaments of the cosmic web, showing that broken time symmetry is not an exception, but a driver of fundamental processes.

The conclusion

In Kalascape cosmology, mass and energy are treated as distinct rather than interchangeable, and time and space are likewise separated, each playing independent roles in shaping the universe. Mathematics can formally equate them, but in the physical reality of the cosmos they remain fundamentally different. Unity in equations does not imply unity in nature. Time Dilation Modulation (TDM) explains flat galactic rotation curves through asymmetric flows of time rather than unseen mass. Kalashield, a time-frozen shell at the Schwarzschild radius, halts black hole collapse and prevents singularities. During black hole mergers, Kalashield ejects mass and energy, generating gravitational waves. Black holes remain stable concentrating their mass at the Kalashield boundary, decreasing temperature and entropy. Beyond certain mass thresholds, black holes transform into filaments of the cosmic web, features often misidentified as dark matter. Kalaglass, a layered temporal medium shaped by gravitational time-dilation gradients, redshifts and refracts light across cosmic distances. The CMB originates as thermal emission from ionized intergalactic plasma and is then filtered and smoothed by Kalaglass. Intriguingly, a black hole symmetrically overloaded with stellar energy may take a form reminiscent of the crown chakra, or thousand-petaled lotus, serving as an abstract metaphor for energy dispersal.
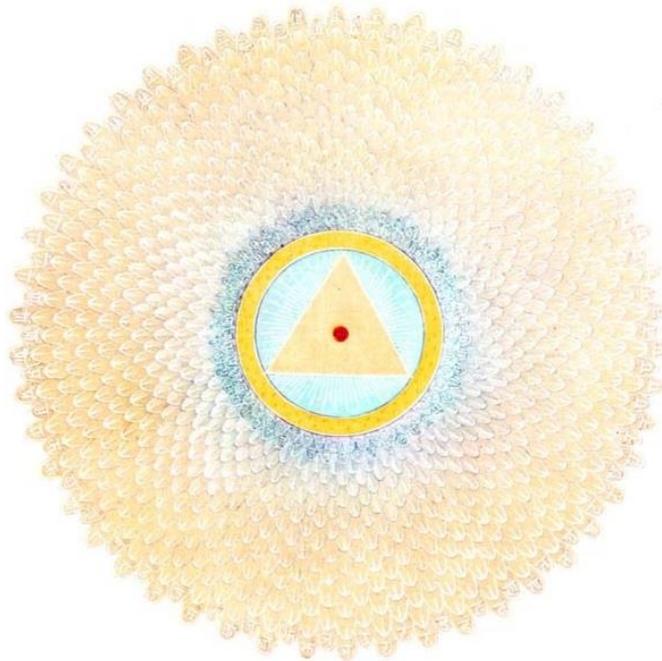
A statue of the Hindu deity Shiva stands at CERN, depicting him as the Lord of the Dance—performing the cosmic dance of creation and destruction, transforming the Universe through energy. Kali, the Goddess of time, destruction and transformation, is often shown dancing alongside Shiva. But in both statue and science, effects of time seem neglected. Yet together, Shiva and Kali symbolize the inseparable forces of energy and time that shape the cosmos. Kali, as goddess of time, destruction, transformation, and renewal, is the natural personification of the Kalascape model. Its most direct manifestation is inside black holes, where time itself consumes and destroys energy.

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Appendix

Consequences of the Kalashield-TDM-Kalaglass Model

I. CORRECTIONS to Standard Misinterpretations

1. Black Hole Singularity

- **Replaced with a Kalashield — a time-frozen relativistic shell preventing infinite density.**

2. Event Horizon

- **No longer a mathematical abstraction. The Kalashield is a real, observable surface where time stops.**

3. Newton's Third Law in Galactic Dynamics

- **Noether's theorem implies that conservation of energy holds only when the system's symmetries are exact. In the presence of time dilation modulation (TDM) the time symmetry is broken.**

4. Redshift Misinterpretation

- **Redshift isn't from expansion, but due to Kalaglass time drag, making Hubble's Law a temporal, not spatial, relationship.**

5. CMB Misinterpretation

- **CMB originates from ionized plasma and is filtered by Kalaglass**

II. EXPLAINED PHENOMENA WITHOUT DARK MATTER / DARK ENERGY

6. Flat Galactic Rotation Curves

- **Caused by differential time flow across galactic radii — not unseen mass.**

7. Dark Matter Filaments

- **Are actually shredded Kalashields from overmassive black holes — regular matter at low temperature compressed by time and gravity.**

8. Dark Energy

- **Explained by cumulative redshift and dimming from Kalaglass, not acceleration of space.**

9. Tolman Dimming

- **Explained by cumulative redshift and dimming from Kalaglass, not acceleration of space.**

III. OBSERVATIONAL ANOMALIES ACCOUNTED FOR

10. Quasar Polarization Alignment

- **Q-LAK are filtered and aligned by Kalaglass over cosmological distances.**

11. Coherent Light from Distant AGNs

- **Preserved via Q-LAK collimation, not degraded as expected by intergalactic scattering.**

12. Brightness Variability at High Redshift

- **Explained by Kalashield surface of the quasars**

13. Anomalous Redshift Distributions

- **Q-LAK light may gain redshift through Kalaglass, not just by distance — explaining mismatches.**

14. Gravitational Lensing Excess

- **Partially due to refractive bending in Kalaglass, not only from space curvature by mass.**

IV. NEW INTERPRETATIONS OF COSMIC STRUCTURE & EVOLUTION

15. Relativistic Jets from AGNs

- **Caused by ruptures in Kalashield, not from disk dynamics or magnetic acceleration alone.**

16. Cosmic Web Formation

- **Formed by Kalashield failures at black hole mass limit (~10^9 M$\odot$), transforms into filaments.**

17. Upper Limit of Black Hole Mass

- **Structural failure of Kalashield beyond certain mass (~10^9 M$\odot$) as shell becomes thin and tears up.**

18. Post-Merger Ejecta and EM Flares from Black Holes

- **Explained by Kalashield deformation and energy overflow, not just tidal fallback. During merging of Black holes eject mass from Kalashield emitting gravitational waves. Mass is not converted into energy.**

V. MICROPHYSICS & THERMODYNAMICS

19. Hawking Radiation

- **Still valid but reframed: arises on Kalashield shell and is proportionate with mass. Most of the mass is on the shell and less in the center – no singularities.**

- **Scales with surface area due to the physical shell geometry of Kalashield and distribution of mass**

21. Information Paradox

- **Resolved: No information is lost inside a singularity — it's stored on the shell.**

VI. PHILOSOPHICAL AND CONCEPTUAL ADVANCES

22. Misreading of Einstein's Equations

- **Shows Einstein's own equations hinted at Kalashield, as values of gravitational time dilation can't have imaginary values.**

23. Role of Time in Structure Formation

- **Time isn't just a coordinate — it's an active agent shaping mass, motion, and light.**

24. Origin Without Singularity or Inflation

- **The universe can't support singularity like a Big Bang — large-scale structure can form via Kalashield collapse and rupture and have low density.**

"Perfection is achieved, not when there is nothing more to add, but when there is nothing left to take away." — Antoine de Saint-Exupéry